innovative air handling units

EN

Control gear for Supply and Supply-Exhaust Air Handling Units

Operation and Maintenance Manual

ventus

DTR- CG ACX36 EVO –ver.1.4 (02.2011)

APP_v112 controller software version compatibility

EN

The control gear complies with European Standard

IEC/EN 60439-1 + AC Standard Switchboards and low-voltage control gears

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I. USER'S MANUAL

1. DESCRIPTION OF CONTROLS

1.1. INTRODUCTION

Application:

Protection and control of supply and exhaust AHUs equipped with up to:

- ○ two fan sets (up to 8 fans in total) and two air dampers
- ○ cooler, heater, heat recovery system
- ○ optional pre-heater (in specified units)
- ○ three filtration sections

Range of operation:

VS 10-15 CG ACX36 EVO	**VS 21-150 CG ACX36 EVO … VS 180-300 CG ACX36 EVO … VS 400-650 CG ACX36 EVO …**
Systems equipped with one-phase motors with up to 1.75kW power output	Systems equipped with frequency converters and motors with up to 11kW power output

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1.2. MAINS SWITCH

Function:
Switching the control gear On / Off

1.3. COMMUNICATION PORT

RJ45 socket, is placed In front of the control gear housing

Function:
Connecting the VS 00 HMI Advanced EVO control panel to the controller

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1.4. SIGNALLING CONTROLLER STATUS

In a right lower corner of the controller there is a LED indicator marked “BSP” to show the controller’s operation mode:

1. LED switched off – controller is not connected to power supply
2. Green light – correct operation, controls over the AHU functions
3. Yellow light - program stopped (see „Scope” application)
4. Yellow blinking – no program (or program erased)
5. Red light – controller in error state

!	1. All control gears of the VS…CG ACX36 EVO typeline need to be powered from the main switchgear equipped with appropriate protection of wires powering the control box. 2. Assembly, wiring and start-up of the control gear should by done by qualified staff only. Without additional elements the control gears can work inside a building. Assembly outside in a moderate climate is permissible if an additional heating module is assembled. The X0:4,N clamps are designed to power that module. (ratings: 230V AC, 6A)

1.5. ADVANCED CONTROL PANEL VS 00 HMI ADVANCED EVO

EN

LCD Display
Displaying available parameters, settings and current values
Key symbol – in the upper left corner indicates the service access level – protected with a password
Most top line – title of the page

Note! *Numbers in the upper right corner, e.g. 5/12 indicate, that the cursor position is line No.5 of 12 lines available.*

If the text length exceeds the line limit, it begins to scroll if marked with a cursor.

Push & Roll knob
It’s the main navigation and operation tool. Rotate it to search across the menu, push to go inside, select parameters and change their values.

Note: *If the parameter value is backlit by the cursor – it can be edited. If is not backlit – then is read-only*

The ▶ symbol shows a link to the next screen. Push the knob to enter

INFO Button & LED
Jump to the start page

BELL Button

Jump to alarm handling pages
The button flashes in red, when any alarm needs acknowledge

ESC Button
Jump to the previous page or leaving the parameter change

Magnetic bottom
For easy assembly the HMI Advanced EVO on the metal sufaces, e.g. the Ventus housing

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Functions:

- Air handling unit operation, parameterization and maintenance
- Selection of control application
- Access to operation parameters of the AHU subassemblies
- Time zones setting
- Displaying and canceling alarm statuses, viewing alarm history
- Indication of current state of the application – the INFO LED
  - Off – Off / Fan overrun / Fire mode
  - Green – Comfort / Economy mode
  - Green blinking – Startup / Night cooling / Standby mode
  - Orange – Alarm / Emergency stop / Configuration mode

!	*Parameters available in the LCD window depends on a AHU type and the control application. Hence in AHUs not equipped with heater, options related to the heating module will not be visible.* *HMI Advanced EVO can't serve as a room temperature sensor*
☝	*Optional element* *One HMI Advanced EVO can work with several controllers if networked via the PB socket (Process Bus) instead of standard dedicated connection T-HI. The use of HMI Basic EVO is then forbidden, as they are intended to use the same PB port.*

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1.6. SIMPLIFIED CONTROL PANEL - VS 00 HMI BASIC

1. LCD Display
Indicates actual room temperature or temperature on the main control sensor as well as a chosen seting, operation mode, fan speed, time and day of the week.

2. ON/OFF button
Switching between On/Off state (forcing the unit to stop or enabling operating mode selection)

3. Presence button
Temporary activation of the comfort mode, automatic cancellation after 1 hour.

4. PROG button
Button for simple calendar programming

5. –
Button for setpoint adjustment

6. +
Button for setpoint adjustment

7. OK button
Button for confirmation

8. Fan button
Button for fan speed setting

9. Mode button
Button for operating mode

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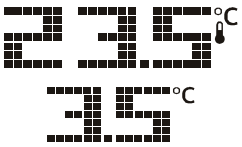	Display of the room sensor temperature or the value of the temperature setpoint offset Note! Setting is limited to ±6°
	Icons for active recirculation, cooling or heating
	Icons for the operating mode: comfort or economy
	Time indication
	Display of the fan speed setting or the indication of automatic fan mode
	Indications of the weekdays
	Icon for active recovery unit
	Icon for activated presence mode
	Icon for alarm event
	Icon for Off mode

Functions:

- Room temperature measurement and display
- Change and display of temperature setpoint offset
- Change and display of fan setpoint
- Change of AHU operation mode
- Info on alarm status

	Optional element *Connects to the controller via the PB socket (Process Bus).*

1.7. „SAPHIR SCOPE" - DIAGNOSTIC AND CONTROL SOFTWARE

	Program variables window Access to all program objects. Possibility of generating timebased charts of any variables Calendar Convenient programming of AHU operation modes according to annual calendar

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SaphirScope is a 32-bit application and requires at least PC with Microsoft® Windows® 2000, Service Pack 3

Works over USB connection or over the Ethernet link (if present in the controller) for the fast and reliable remote operation

1.8. WEB-SERVER OPTION – AVAILABLE IN EVO-WEB CONTROL GEARS

Gives a full copy of the HMI Advanced EVO with all it's functionality in the standard web browser like Internet Explorer

MODBUS TCP/IP – AVAILABLE IN EVO-WEB CONTROL GEARS

Gives extended access to read / write parameters like measurement readouts, setpoints, settings, output values, selected calendar settings, alarms. Total count of available parameters exceeds 200 datapoints.

2. SYSTEM START-UP

EN

! *Operation of the AHU is strictly arrested by the fire-protection alarm, activation of the thermal protection of fans' motors, threefold activation of the protection of electric heater and threefold activation of the anti-frost thermostat. Each of these events requires removing the cause of the alarm and then canceling it (see more details in Advanced Manual).*

2.1. SWITCHING ON POWER SUPPLY

Switching on power supply of the control gear with the mains switch (Q1M). Correct controller operation is indicated by green LED "BSP" in the right lower corner of the controller. If the LED is red or does not blink at all, contact the service.

The system is ready for operation after about half minute from switching on.

2.2. VS 00 HMI Advanced EVO

excellence in simplicity
V E N T U S 000780 menu ▶

The number is a unique identification of the controller, so the user could know which controller is connected at the moment.Setting the cursor on the "menu" link and pressing the Push&Roll knob enters the main menu page

Main menu		
Operating mode HMI	Off	
Operating mode	Off	
Outside temp.	16.5°C	
Supply temp.	17.2°C	
AHU menu		▶
Alarm menu		▶
PL/EN/RU		▶
Password enter		▶
Service menu		▶
System menu		▶

Operating mode HMI – is used to set the main operating mode from the HMI

Operating mode – indicates current AHU mode resulting from HMI setting, alarms, external control signals etc.

Outside temp. / Supply temp. – here the main temperature measurements are indicated. Those lines can be hidden / expanded depending on the amount of temperature sensors actually activated in the unit

AHU menu – main path for routine service and for tuning the unit

Alarm menu – gives access to alarm handler – alarm list, alarm history, alarm acknowledge and cancel

PL/EN/RU – language selection

Password enter – is used to enter to special settings and hidden parameters

Service menu – is used for startup setting (password protected)

System menu – gives important system information on OS and application versions and lets to configure communication interfaces, like IP number (password protected)

NOTE! *All the menus are dynamically changed, as they depend on the application settings and the password level*

2.3. VS 00 HMI Basic EVO

☝	*If the system did not start, check the F1 protection status* *Correct device operation depends on the application settings. Choosing and setting up the application should be done by qualified service provider, according to recommendations of part II „Advanced manual”*

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2.4. HMI ADVANCED EVO SETTINGS & CONNECTING TO THE CONTROLLER

Holding the ESC button, the internal menu of the HMI Adavnced can be entered.

HMI Settings – settings for the functionality of the device

- version of the firmware – read only
- Backlight color – setting for screen color – white or blue
- Backlight turn off time in seconds
- Contrast
- Brightness

Controller list → Local connection → [press the knob] The HMI will connect to the controller via standard dedicated T-HI socket (RJ45-type placed in the rightmost bottom corner of the controller's housing).

Controller list → [select the controller] → [press the knob] The HMI will connect to the selected controller if networked over the PB (Proces Bus) connection (the T8 terminal).

Note! *See the electrical diagrams for the details.*

VS 00 HMI Advanced EVO

HMI settings		▶
Controller list		▶

Controller list		
POL638_02988A		▶
POL638_02988C		▶

2.5. LANGUAGE SELECTION

VS 00 HMI Advanced supports the following languages:

EN English

PL Polish

RU Russian

English is set as a default language.

Selection path: Main menu → PL/EN/RU → PL/EN/RU → select: English / Polski / Русский

2.6. ENTERING THE PASSWORD

Many parameters are protected with a password, to avoid unintentional change, that could be dangerous for the unit or for the user. To access that parts of the menu, a password must be entered.

Path: Main menu → Password enter → enter: 1357

Use the Push&Roll knob to change the numbers and to confirm

After entering the password the HMI Advanced will switch to the Main menu screen

☝	*Observe the "key" symbol in the upper left corner of the display. After specified time without any operation on the HMI Advanced, the interface will log off and go back to limited access mode* *The password can be changed with Scope tool application via Edit datapoints / Device / SystemObjects / HMIPassword / member 0x0005: User Password*

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2.7. DIRECT SELECTION OF OPERATING MODE

The AHU can operate in one of the following operating modes.

Auto – AHU operates depending on

- the calendar programming
- HMI Basic EVO
- external control signals (binary inputs)
- critical temperatures, e.g. too low temperature causes AHU start and immediate heat-up of the room

Off – AHU switched off

- fans stopped
- dampers and control valves closed
- all sensors and gauges are activated – in order to protect the unit from damage, e.g. fire alarm, frost protections

StartUp – AHU starting – time for all special functions like pre-heating of the water heating coil

Eco St1 – Economy mode with air volume stage 1

- if frequency converters are present, fans operate on the lower frequency setting
- in VS 10-15 units, without the frequency converters, fans are turned on
- the temperature control algorithm uses separate setpoint and broad deadzone to reduce energy consumption for cooling / heating actions

Comf St1 – Comfort mode with air volume stage 1

- fans operate as described above
- the temperature control algorithm uses dedicated setpoint and narrow deadzone to ensure high quality and stable parameters for the users

Eco St2 / Comf St2 – mode with air volume stage 2

- if frequency converters are present, fans operate on the higher frequency setting

Note! *Stage St2 is not available in units VS 10-15 where the fans are powered directly from the power network.*

VS 00 HMI Advanced EVO

Selection path: **Main menu → Operating mode HMI → select: Auto / Off / Eco St1 / Comf St1 / Eco St2 / Comf St2**

Main menu		
Operating mode HMI	Off	
Operating mode	Off	
Outside temp.	16.5°C	
Supply temp.	17.2°C	
AHU menu		▶
Alarm menu		▶
PL/EN/RU		▶
Password enter		▶
Service menu		▶
System menu		▶

VS 00 HMI Basic EVO

⏻ - press the buton to switch on / off the unit. When switched on, the unit either enters automatic settings from the calendar, or can be forced to another operating mode from the HMI Basic with Mode button (Comf or Eco)

- press the buton to locally force the fan speed setting. 7 steps are possible 17% / 33% / 50% / 67% / 83% 100% / Auto

Note! *To cancel modes forced from the HMI Basic, use the ⏻ button to turn off the unit and then press it again to turn on. The calendar mode from the controller will be restored automatically.*

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Fire – operating mode enabled by fire alarm input. All the devices switched off, the fans stop or run with selected setpoint (see chapter AHU menu → Fans)

OverRun – AHU switches off, but the fans keep running on the lower speed stage St1 until the heater is cooled down (see chapter AHU menu → Fans)

NightClg – Night Cooling – a mode for energy saving by cooling down the room using cold air from the outside in the night. Available only in the units with external temperature sensor.

Standby – protection mode for min/max room temperature – if the temperature exceeds specified setpoints, AHU is switched on, to heat up or cool down to desired range. Then switches off again.

NightKick – testing mode, that forces fans to run in order to exchange the air in the ventilation system.

Note! *Night cooling and Standby functions rely on room temperature. If there's no measurement in the room, the exhaust duct sensor is taken into account and gives the readout. This requires turning on the fans to have appropriate room temperature value on that sensor.*

☝ *The unit can be controlled from several sources. Mind the priorities between them.*

1. HMI Advanced EVO (highest priority)

a. The WEB-Server virtual HMI – it is of the same priority as the original HMI Advanced EVO. When using both in the same time, the changes are applied from one to another in both directions

2. External control inputs

3. HMI Basic EVO

4. The BMS over Modbus TCP/IP connection

5. The calendar mode

Note! *To enable another sources than the HMI Advanced, the Operating mode HMI must be set to Auto*

3. SYSTEM OPERATION

3.1. AHU MENU → OPERATING MODE

Actual – indicates current AHU mode resulting from HMI setting, alarms, external control signals etc.

Operating mode HMI - is used to set the main operating mode from the HMI – copy from the Main menu

Time switch program – allows for calendar settings for automatic operation. The controller is equipped with real time clock to handle that functionality.

VS 00 HMI Advanced EVO

AHU menu	
Parameter overview	▶
Operating mode	▶
Temperature control	▶
Fans	▶
Inputs	▶
Outputs	▶
Loop controllers	▶
User Prog	▶

From BMS – indicates the operating mode requested from BMS link over the Modbus TCP/IP connection

Note! *Control over Modbus TCP/IP is available only in* ***WEB*** *control boxes.*

External control – indicates the operating mode resulting from the digital inputs, gives a link to configuration of ext. control functionality (see Advanced manual)

Standby temp. check
Night cooling
Standby settings
gives links to settings for Night Kick, Night Cooling and Standby functions (see Advanced manual)

Power up delay – allows to set the time from the unit power up to the startup of the unit.Range: 0..36000 sec Default: 10 sec

Password protected

Operating mode		
Actual	Off	
Operating mode HMI	Off	
Time switch program	Off	▶
From BMS	Auto	
External control	Comf-St1	▶
Night cooling		▶
Standby settings		
Power up delay	10	

3.1.1. AHU MENU → OPERATING MODE → TIME SWITCH PROGRAM

Schedule – indicates the current mode from the calendar, gives a link to day-by-day settings

Calendar exception – indicates the current mode from exception calculation, gives the link to set 10 periods or specific days when the unit works according to *Exception* settings made in the previous screen *Schedule*.

Calendar fix off – indicates the current mode from fix off calculation, gives the link to set 10 exceptions when the unit is off, regardless to Schedule settings

Lock HMI Basic – setting HMI Basic and Calendar cooperation priority

- NO – HMI Basic can start the unit and change operation modes at aby calendar settings
- YES – HMI Basic cannot control the unit if the Calendar is set to OFF at the moment

ATTENTION! *in order to change the settings one should stop the unit first with the use of the main HMI Advanced menu: HMI operation mode: OFF*

VS 00 HMI Advanced EVO

Time switch program		
Schedule	Off	▶
Calendar exception	Passive	▶
Calendar fix off	Passive	▶
Lock HMI Basic	NO	

3.1.2. AHU MENU → OPERATING MODE → TIME SWITCH PROGRAM → SCHEDULE

Present value – indicates the current mode from the calendar

Monday..Sunday - indicates the current mode for each day, gives a link to the settings

VS 00 HMI Advanced EVO

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Exception – indicates the current mode from exception module, that overrides the day-by-day settings

Copy schedule – allows for copying the schedule from Monday to all other weekdays

Setting the daily program or exception program

Present value – indicates the current mode from the calendar

Day schedule – indicates the current mode for selected day

Schedule		
Present value	Off	▶
Monday	Off	▶
Copy schedule	Monday to	
Tuesday	Off	▶
Wednesday	Off	▶
Thursday	Off	▶
Friday	Comf St1	▶
Saturday	Off	▶
Sunday	Off	▶
Exception	Off	▶

Time 1..Time 6 – defines the time when the corresponding mode has to be activated

Value 1..Value 6 – defines the mode Select: Off / Eco St1 / Comf St1 / Eco St2 / Comf St2

Note! *Modes are described above in the section Direct selection of operating mode*

Time 1 should always be set as 00:00, before the first application all controller settings are set to zero by default.

Monday	
Present value	Off
Day schedule	Passive
Time 1	00:00
Value 1	Eco St1
Time 2	08:00
Value 2	Comf St1
Time 3	18:00
Value 3	Eco St1
Time 4	*:*
Value 4	Off
Time 5	*:*
Value 5	Off
Time 6	*:*
Value 6	Off

3.1.3. AHU MENU → OPERATING MODE → TIME SWITCH PROGRAM → EXCEPTION / FIX OFF

VS 00 HMI Advanced EVO

EXCEPTION – these settings enable the *Exception* time schedule defined in previous menu *Schedule*.

FIX OFF – these settings specifies the time periods when the AHU is switched off.

Present value – indicates the current mode from the exception calculations

Choice-1..Choice-10 – selects the type of exception:

- Date – one single day
- Range – from…to
- WeekDay – specific weekday
- Passive – exception disabled

Calendar exception	
Present value	Active
Choice-1	Range
-(Start)date	Mo, 05.May.09
-End date	Mo, 05.Sep.10
-Week day	*,*,*
Choice-2	Date
-(Start)date	Mo, 24.Aug.09
-End date	*.*.*
-Week day	*,*,*
(...)	
Choice-10	WeekDay
-(Start)date	*.*.*
-End date	*.*.*
-Week day	3rd,We,Aug

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3.2. CALENDAR MODE IN HMI BASIC EVO

HMI Basic is capable of editing the basic part of the time switch program, the SCHEDULE. Via HMI Basic, user can define maximum of 6 time zones, separately for 7 days of the week. The settings can be also made for a group of selected days.

Note! *All the settings are stored in SCHEDULE the same way like with the HMI Advanced and can be accessed from both devices.*

VS 00 HMI Basic EVO

Note! *The EXCEPTION and FIX OFF settings are not accessed via HMI Basic.*

Setting the program for selected days:

1. Long-press the PROG button
2. Use the +/- buttons to select the blinking number of the day (from 1 to 7)
3. Confirm the day with OK button
   Repeat steps 2 and 3 until selecting all necessary days or go further if one day is to be programmed.
4. When reaching the last, 7th day, press the + again, so all selected days will be visible with blinking cursors over each of them and then press OK to confirm the selection
   Now the time zones appear and can be edited.
5. Press OK button to enter time zone edit mode
   First press: hour can be set (with +/- buttons)
   Second press: minutes can be set
   Third press: the mode can be set
   Fourth press: the programmed zone is displayed
6. Press + button to move to the next time zone and do the settings as described in p.5

Note! *In the first time zone, the time setting must be 00:00.*

7. Press the PROG button to return to day selection screen – another days can be selected for another zone configuration.If not needed, press PROG again to leave time switch programmer.

The modes are selected by a number, that corresponds to the mode available from the HMI Advanced menu:

For VS10-15 units without frequency converters those are:
0 – Off
1 – Eco Stage1
2 – Comf Stage1

For VS10-15 and VS21-650 units with frequency converters those are:
0 – Off
1 – Eco Stage1
2 – Comf Stage1
3 – Eco Stage 2
4 – Comf Stage 2

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3.3. AHU MENU → TEMPERATURE CONTROL

There are two main modes of temperature control in ACX36 EVO controller.

- Direct air supply control - if the air supply temperature sensor is set as the main control sensor; there are no additional settings for min/max temperature of the supplied air.
- Cascade supply control – when room or exhaust temperature sensor is selected – two additional setpoints are activated to control min/max temperature of supply air

Note! *The Temperature control screens are different in each case*

Controlled temp. – shows the temperature from the main sensor

Temp. setpoints – gives a link to setpoint screen

Temp. setpoints Cascade – gives a link to setpoint screen and indicates the actual cascade setpoints

VS 00 HMI Advanced EVO

Direct supply control

Temperature control			
Controlled temp.	17.3	°C	
Temp. setpoints			▶
Heat recovery	0	%	▶
Water heater	0	%	▶
Cooler	0	%	▶
Pre-heater	0	%	▶

Heat recovery – indicates the rate of recovery unit, gives a link to detailed screen

Heater – indicates the rate of heating, gives a link to detailed screen

Cooler – indicates the rate of cooling, gives a link to detailed screen

Pre-heater – indicates the rate of additional heater, gives a link to detailed screen

Actual season – selection of the current working mode for universal heating/cooling coil. If “Winter” selected – the coil works as a water heater. If “Summer” selected – the coil works as a water cooler.

- Selection HMI – Winter/Summer
- Password protected
- Binary input – Winter/Summer – universal binary input can be configured as a season selector

Note! *The pipeline has to be switched manually between supplying from chiller or from boiler. The season selection must be done according to the actual state of the piping.*

Note! *The Summer mode has got higher priority over the Winter mode, regardless to the control source – HMI or binary input or BMS command over Modbus TC/IP connection.*

Note! *The visibility of above described devices depends on their presence in the unit. If there’s no pre-heater, that line and link will be hidden.*

Cascade supply control

Temperature control			
Controlled temp.	16.7	°C	
Temp. setpoints			▶
Cascade			▶
20.0°C	18.0°C		
Heat recovery	0	%	▶
Water heater	0	%	▶
Cooler	0	%	▶
Pre-heater	0	%	▶

VS 00 HMI Basic EVO

Press plus / minus buttons to set the temperature setpoint offset – this will be added (or subtracted) to the main setpoint applied in the HMI Advanced. The allowed range is ± 6°C.

EN

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3.3.1. AHU MENU → TEMPERATURE CONTROL → TEMPERATURE SETPOINTS

Controlled temp. Room – indicates the main temperature setpoint and its current value

Cooling setpoint / Heating setpoint – indicate current values for heating / cooling actions calculated according to the current operating mode (Eco or Comf), the setpoints and the deadzones

Comfort setpoint – settings for the desired temperature in Comf mode
Range: 0..50
Default: 21

Comfort deadzone – settings for the allowed non-sensitive range in Comf mode. Available if there's a heater and a cooler in the unit.
Range: 0..20
Default: 2

Economy setpoint / Economy deadzone – as described above, but for Eco mode
Setpoint range: 0..50; default: 21
Deadzone range: 0..20; default: 6

Multi-fun AI setpoint – the offset to original setpoint, set according to the value of the universal analog input

Pre-heater setp. – setting the desired temperature for the
pre-heating coil

Note! *The pre-heating coil works out of the standard cooling/heating sequence. It is intended just to keep the constant temperature in specified place, e.g. to heat up outside air before entering the heat recovery unit.*

Cascade setpoint – indicates the actual cascade setpoints

Supply temp. min. setp – setting for lower boundary for supply air temperature
Range: -64..99
Default: 15

Supply temp. max. setp – setting for upper boundary for supply air temperature
Range: -64..99
Default: 25

Note! *Cascade setpoints and Supply temp. min/ max setpoints isible only when the Room or Exhaust sensor is the main one.*

VS 00 HMI Advanced EVO

Temperature setpoints		
Controlled temp.		°C
Room	16.7	°C
Cooling setpoint	22.0	°C
Heating setpoint	20.0	°C
Cascade setpoint	20.0	°C
Cascade setpoint	18.0	°C
Multi-fun AI setpoint	-3.0	°C
Comfort setpoint	21.0	°C
Comfort deadzone	2.0	°C
Economy setpoint	21.0	°C
Economy deadzone	6.0	°C
Pre-heater setp.	-10.0	°C
Supply temp. min. setp	15.0	°C
Supply temp. max. setp	25.0	°C

VS 00 HMI Basic EVO

Press plus / minus buttons to set the temperature setpoint offset – this will be added (or subtracted) to the main setpoint applied in the HMI Advanced.

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3.3.2. AHU MENU → TEMPERATURE CONTROL → RECIRCULATION

Recirculation mode – selecting the operation mode for the recirculation chamber

- **MECH – Maximum Energy Changeover**– control from the PID controller, recirculation plays the role of the first heating / cooling section in order to take full advantage of energy recovery, the scope of possible changes concerning recirculation is defined by fixed setting of minimum fresh air.

Min. fresh air		20	%	

- **MECH.Multi** – as above, however the minimum fresh air setting is defined separately for different operation modes and fan steps.

	1.st	2.st		
Eco	20.0%	20.0%		
Comf	20.0%	20.0%		

- **Manual** – fixed manual recirculation settings

Manual mode		20	%	

- **Manu.Multi** – manual recirculation settings with differentiating the operation mode and fan stages

	1.st	2.st		
Eco	20.0%	20.0%		
Comf	20.0%	20.0%		

- **Univ.AI** – control from the universal analog input; the range of possible changes is limited by the setting of minimum fresh air

Controller – it indicates the actual signal from the recirculation controller, specifies the link to the detailed settings screen (the link is protected with a password - see the Advanced Manual).

Recirculation rate – indicates current position of the mixing damper, gives a link to output detail screen (password protected link – see Advanced Manual)
0% – closed, 100% – opened

Note! *In given example screen, the unit is in Off mode, so the controller signal is 0%, but the actual position of mixing damper is 100% to ensure closing the intake / outlet dampers.*

Min. fresh air – setting for min. opening of intake / outlet dampers to provide fresh air in the ventilated room
Range: 0..100%
Default: 20%
Password protected

Manual mode – setting fixed values of recirculation for Hand and Hand.Multi modes
Range: 0..100%

VS 00 HMI Advanced EVO

Recirculation				
Recirculation mode	MECH			
Controller		0	%	►
Recirculation rate		100	%	►
Min. fresh air		20	%	
	1.st	2.st		
Eco	20.0%	20.0%		
Comf	20.0%	20.0%		
Manual mode		20	%	
	1.st	2.st		
Eco	20.0%	20.0%		
Comf	20.0%	20.0%		
Startup time		60	S	
Enable temperature		15.0	°C	

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Default: 20%

Protected with a password

Startup time – time delay to synchronize the recirculation in startup sequence. See **Enable temperature** below
Range: 0..600 sec
Default: 60 sec
Password protected

Enable temperature – setting for the unit startup. If external temperature falls below that limit, the recirculation is forced to 100% during unit startup. The forcing is kept until the **Startup time** specified above.
Range: -64..64
Default: 15
Password protected

3.3.3. AHU MENU → TEMPERATURE CONTROL → HEAT RECOVERY

Controller – indicates the current signal from recovery controller, gives a link to controller details screen (password protected link – see Advanced Manual)

Recovery rate – indicates current recovery capacity, gives a link to output detail screen (password protected link – see Advanced Manual)
0% – no recovery, 100% – full recovery

Note! *The controller signal can differ from the actual recovery rate due to protective functions that could affect it.*

Glycol pump – indicates current state of the pump, gives a link to pump detail screen (see Advanced manual)

Frost protection – indicates the rate of frost protection, that is subtracted from controller signal in order to protect the recovery unit from freezing; gives a link to a screen with the setpoint and frost controller details

- Frost protection / Controller – see Advanced manual AHU menu → Loop controllers
- Frost protection / Setpoint
  Range: -64..64
  Default: 3.0
  Password protected

Startup time – time delay to synchronize the recovery in startup sequence. See **Enable temperature** below.
Range: 0..600 sec
Default: 60 sec
Password protected

Enable temperature – setting for the unit startup. If external temperature falls below that limit, the heat recovery is forced to 100% during unit startup. The forcing is kept until the **Startup time** specified above.
Range: -64..64

Default: 15

Password protected

VS 00 HMI Advanced EVO

Option 1: Glycol coils

Heat recovery			
Controller	0	%	▶
Recovery rate	0	%	▶
Glycol pump	On		▶
Frost protection	0	%	▶
Startup time	60	s	□
Enable temperature	15.0	°C	□

Option 2: Plate cross-flow heat exchanger

Heat recovery			
Controller	0	%	▶
Recovery rate	0	%	▶
Frost protection	0	%	▶
Startup time	60	s	□
Enable temperature	15.0	°C	□

Option 3: Rotary regenerator

Heat recovery			
Controller	0	%	▶
Recovery rate	0	%	▶
Frost protection	0	%	▶
Startup time	60	s	□
Enable temperature	15.0	°C	□
Freq converter RRG			▶

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Freq. converter RRG – link to FC details and setpoints

- **Freq. low limit** – lower boundary of the frequency
  Range: 10..25Hz
  Default: 15Hz
  Password protected
- **Freq. high limit** – upper boundary of the frequency
  Range: 35..65Hz
  Default: 55Hz
  Password protected
- **Drive current** – actual load
- **Drive status** – state of the drive
- **Comm status** – state of the Modbus link

Freq converter RRG		
Freq. low limit	15.0	Hz
Freq. high limit	55.0	Hz
Motor current	0.0	A
Drive status	OK	
Comm status	Fault	

3.3.4. AHU MENU → TEMPERATURE CONTROL → HEATER

Controller – indicates the current signal from heating controller, gives a link to controller details screen (password protected link – see Advanced Manual)

Heating rate – indicates current heating capacity, gives a link to output detail screen (password protected link – see Advanced Manual)
0% – no heating, 100% – full heating

Note! *The controller signal can differ from the actual heating rate due to special functions that could affect it.*

Circulation pump – indicates current state of the pump, gives a link to pump detail screen (see Advanced manual)

Preheating – indicates the state of the preheating mode, gives a link to a detail screen (see Advanced manual)

Frost monitors – indicate the state of frost protection inputs, give a link to a detail screens (see Advanced manual)

Note! *Default unit configuration uses 2 separate frost protection devices. If only one is needed, then the other input can be used as multi-function input to be utilized by the end user. See Advanced manual.*

Alarm – indicates the state of overheating alarm input. In case of the alarm, unit is switched off with OverRun function – to cool down the heater; gives a link to detail screen (see Advanced manual)

Limitations from fan – settings for the maximum electric heater output corresponding with each fan state St1 and St2.

- **Limitations from fan / On fan stage 1**
  Range: 0..100%
  Default: 100%
  Password protected
- **Limitations from fan / On fan stage 2**
  Range: 0..100%
  Default: 100%
  Password protected

VS 00 HMI Advanced EVO

Option 1: Water coil

Water heater			
Controller	0	%	▶
Heating rate	0	%	▶
Circulation pump	On		▶
Preheating	Off		▶
Frost monitor	OK		▶
Frost monitoring 2	OK		▶

Option 2: Electric heater

Heater			
Controller	100	%	▶
Heating rate	100	%	▶
Alarm	OK		▶
Limitations from fan			▶

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3.3.5. AHU MENU → TEMPERATURE CONTROL → COOLER

Controller – indicates the current signal from cooling controller, gives a link to controller details screen (password protected link – see Advanced Manual)

Cooling rate – indicates current cooling capacity, gives a link to output detail screen (password protected link – see Advanced Manual)

0% – no cooling, 100% – full cooling

Min. out temp – setting for the temperature limit. If external temperature falls below that value, the cooling functionality is disabled.

Chiller – indicates the current state of the chiller, gives a link do detail screen.

Chiller / Alarm – indicates the state of th e device, gives a link to further details (see Advanced manual)

Chiller / Off delay – setting for the off delay time
Range: 0..xxxx sec
Default: 30 sec
Password protected

DX cooler state – indicates the current state of the DX cooler: Off / Stage1 / Stage2; gives a link to detail screen (see Advanced manual)

Limitations from fan – settings for the maximum cooler output corresponding with each fan state St1 and St2.

- **Limitations from fan / On fan stage 1**
  Range: 0..100%
  Default: 100%
  Password protected
- **Limitations from fan / On fan stage 2**
  Range: 0..100%
  Default: 100%
  Password protected

VS 00 HMI Advanced EVO

Option 1: Water coil

Cooler			
Controller	0	%	▶
Cooling rate	0	%	▶
Min. out temp.	12.0	°C	
Chiller	Off		▶

Chiller details

Chiller			
Chiller	Off		▶
Alarm	OK		▶
Off delay	30	s	

Option 2: DX cooler

Cooler			
Controller	0	%	▶
Cooling rate	0	%	
Min. out temp.	12.0	°C	
DX cooler state	Off		▶
Limitations from fan			▶

3.3.6. AHU MENU → TEMPERATURE CONTROL → PRE-HEATER

Controller – indicates the current signal from heating controller, gives a link to controller details screen (password protected link – see Advanced Manual)

Heating rate – indicates current heating capacity, gives a link to output detail screen (password protected link – see Advanced Manual)
0% – no heating, 100% – full heating

Note! *The controller signal can differ from the actual heating rate due to special functions that could affect it.*

Circulation pump – indicates current state of the pump, gives a link to pump detail screen (see Advanced manual)

VS 00 HMI Advanced EVO

Pre-heater			
Controller	0	%	▶
Heating rate	0	%	▶
Pre-heater setp.	-10	°C	
Circulation pump	Off		▶
Preheating	Off		▶
Frost monitor	OK		▶

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Preheating – indicates the state of the preheating mode, gives a link to a detail screen (see Advanced manual)

Frost monitor – indicate the state of frost protection input, give a link to a detail screens (see Advanced manual)

Note! *Pre-heater uses only one, separate frost protection device.*

3.4. AHU MENU → FANS

Supply fan / Exhaust fan – indicate the state of the fans: Off / Stage1 / Stage2; gives a link to a detail screen

- **Supply fan / Sup. output signal** – actual setpoint for fans with frequency converters
- **Stage** – current state of the fans
- **Setpoints/settings** – detailed configuration of fans and frequency converters (see Advanced manual)
- **FC details 1..4** – readout of frequency converter's parameters
  - **Output frequency**
  - **RPM**
  - **Current**
  - **Drive status**
  - **Comm. status**

Note! *Ventus AHU can have up to 4 frequency converters in one fan set (MultiFan configuration). All FCs in the fan set have common settings for frequency, ramp-up, ramp-down and the main limits – as they must work synchronously.*

Note! *FC details visible only if frequency converters were enabled during unit configuration*

Note! *In units VS10-15 without frequency converters, only the Supply fan is linked to the settings. Exhaust fans work simultaneously and don't need separate setpoints.*

Fire mode – setting for the fan behavior when there's a fire alarm signal

Range:

- Stop – fans stopped
- Run Sply – supply fan running
- Run Exh – exhaust fan running
- Run Both – supply and exhaust fans keep running

Default: Stop
Password protected

Fire setpoint – setting for the fan speed in fire mode
Range: 0..100%
Default: 80%
Password protected

VS 00 HMI Advanced EVO

Fans			
Supply fan		Stage2	▶
Exhaust fan		Stage2	▶
Actual fan step		Stage2	
Fire mode		Stop	
Fire setpoint	80	%	
Run-down el. heat.	30	sec	

Supply fan			
Sup. output signal	100	%	
Stage		Stage2	
Setpoints/settings	100	%	▶
FC details 1			▶
FC details 2			▶
FC details 3			▶
FC details 4			▶

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Run-down el. heat. – setting for the off delay. When unit turned off, the supply fans continue to work for the specified time to cool down the electric heater.	
3.5. AHU MENU → INPUTS	
Actual input values are available here to check the hardware functionality. **Temperatures** ▪ Room temperature ▪ Supply temperature ▪ Fire alarm temp. – setting for the upper limits of the supply and exhaust temperatures. Above that limit, controller triggers fire alarm and enters fire operating mode Range: 0..100°C Default: 70°C Password protected ▪ Outside temperature ▪ After recovery temperature ▪ Pre-heater temperature **Other** ▪ Multi-fun AI setpoint [°C] ▪ MFAI [%] – multi-function analog input – user configurable **Binary inputs** ▪ External control 1 ▪ External control 2 ***Note!*** *For detailed description of external controls see Advanced manual* ▪ SuWiSwitch – summer / winter season selection ▪ AlmAckBtn – alarm acknowledge button ▪ Emergency stop ▪ MFDI – multi-function digital input – user configurable **Binary alarms** ▪ Fire ▪ Filters ▪ Supply filter ▪ Exhaust filter ▪ Fan alarm ▪ Frost monitoring ▪ Frost monitoring 2 ▪ Electrical heating ▪ Chiller alarm ▪ Cooling DX	VS 00 HMI Advanced EVO Inputs Temperatures ▶ Other ▶ Binary inputs ▶ Binary alarms ▶

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Note! *All listed inputs are related to the unit configuration and the actual set of visible signals will be different from one AHU to another.* *For the input details, refer to the Advanced manual*	

3.6. AHU MENU → OUTPUTS

Actual output values are available here to check the hardware functionality.

VS 00 HMI Advanced EVO

Outputs			
Digital outputs			▶
Analog outputs			▶

Digital outputs

- Sup. fan command
  [Off / Stage1 / Stage2]
- Exh. fan command
  [Off / Stage1 / Stage2]

  Note! *In AHU equipped with frequency converters those are virtual digital states, transmitted vie Modbus communication link.*

- Circulation pump
- Chiller
- DX cooler state
  [Off / Stage1 / Stage2]
- Pre-heater pump
- Air dampers
- Alarm relay
- Multi-function relay 1
- Multi-function relay 2

Analog outputs

- Sup. fan output signal [%] – rate of supply frequency converters
- Exh. fan output signal [%] – rate of exhaust frequency converters

  Note! *The perecentage values refer to max. frequency limit set in AHU menu → Fans*

- Recirculation rate [%] – control signal for the mixing chamber
- Recovery rate [%] – control signal for the heat recovery device
- Heating rate [%] – control signal for the heater
- Cooling rate [%] – control signal for the cooler
- Pre-heater rate [%] – control signal for the pre-heating water coil

  Note! *The percentage values refer to 0..10V hardware output.*

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Note! *All listed outputs are related to the unit configuration and the actual set of visible signals will be different from one AHU to another.*

For the input details, refer to the Advanced manual

3.7. AHU MENU → PARAMETER OVERVIEW

Overview shows AHU parameters – like operating mode, temperature control, inputs / outputs states – but in a form of a list, not structured by function. Most parameters have a link to enter more detailed information and settings.

Note! *All the parameters are copies of those described above.*

The appearance of the parameter overview could be different from one unit to another, as the parameters presence depends on specific AHU configuration.

3.8. AHU MENU → LOOP CONTROLLERS

Refer fo Advanced manual

3.9. AHU MENU → USER PROGRAM

Refer fo Advanced manual

3.10. ALARM MENU → ACCESSED VIA THE MAIN MENU LINK

Actual alarm summary.

Danger (A) and Critical (A) – shows the state of the group of alarm A, that has got the highest priority and always causes the AHU to stop.

Note! *To that group belong e.g. fire alarm and motor overheating*

Low (B) – shows the state of lower-priority group of alarm B.

Note! *Group B and lower, don't stop the AHU, just make alarm indication and record the event in alarm history*

Filter contamination alarm belongs to that group

Warning (C) – shows the state of lowest-priority group of alarm C

Note! *The state for each alarm group could be Normal or Alarm. Those states are read-only*

Alarm relay select – setting for alarm-dedicated relay Q5

- **prio.A** – relay is switched only when an alarm from group A occurs (Danger or Critical)
- **prio.A+B** – relay is switched when an alarm A or B is triggered
  Default: prio.A+B
  Password protected

Alarm output – shows the current state of the alarm relay Q5, gives a link to detail screen (see Advanced manual)

VS 00 HMI Advanced EVO

Alarm menu			
Danger(A)		Normal	
Critical(A)		Normal	
Low (B)		Alarm	
Warning (C)		Normal	
Alarm relay select		prio.A	
Alarm output		OK	▶

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ALARM MENUS – ACCESSED VIA DEDICATED BUTTON

Alarm menu screens can be toggled with button.

Alarm list/-hist settings – settings for the current alarm list and for the alarm history list

- **Sort order 1**
  Time / Name / AlarmClass / State
- **Sort order 2**
  Time / Name / AlarmClass / State
- **Descending order**
  Passive / Active

Note! *All are password protected*

Alarm list – shows the currently active alarms

Acknowledge – shows how many alarms are waiting for acknowledge, gives a link to alarm canceling

- Passive – leave alarms not acknowledged
- Active – acknowledge alarms

Note! *The stage remains Active only one cycle of the controller, so all the new alarms need to be acknowledged again*

Alarm acknowledge is password protected

+ Sup.filter alarm: Alarm – shows the name of the event and the current state, gives a link to detailed page. Plus sign indicates incoming alarm.

Alarm list detail

- +Sup.filter alarm: Alarm – repeat the name and state from the general list
- 2 Low(B) – one of two alarms in group B
- date and time when alarm was recorded

Alarm history – similar to Alarm list – but shows the "plus" events and "minus" events. Minus means, the state of the event changed from Alarm to Normal.

Note! *Alarms can be remanent – they are locked until fixed and acknowledged, e.g. the fire alarm. Or can be non-remanent – they unlock, when the alarm signal is fixed and don't need to be acknowledged to go to the history records, e.g. the filter alarm.Anyway, even with non-remanent alarms, the indicator will remain blinking until acknowledged, to show that something was wrong with the AHU*

VS 00 HMI Advanced EVO

Alarm list/-hist settings		
Alarm list		
Reset		
Sort order 1		Time
Sort order 2		Time
Descending order		Passive
Alarm history		
Reset		
Sort order 1		Time
Sort order 2		Time
Descending order		Active

Alarm list			
Acknowledge	Passive	2	
+ Sup. filter alarm: Alarm			▶
+ Exh. filter alarm: Alarm			▶

Alarm list detail	
+ Sup. filter alarm: Alarm	
2	Low(B)
29.08.2009	08:35:44

Alarm history		
Acknowledge	Passive	8
- Exh. filter alarm: OK		▶
- Sup. filter alarm: OK		▶
+ Exh. filter alarm: Alarm		▶
+ Sup. filter alarm: Alarm		▶

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ALARMING IN HMI BASIC EVO

VS 00 HMI Basic EVO

Alarm in HMI Basic EVO are displayed instead of time indication in a form of a letter and number. The letter stays for the priority of the signal, where A is the highest priority. The number is given to identify what is the source of alarm.

Note! *HMI Basic EVO cannot acknowledge alarms. All non-remanent events will disappear automatically. All remanent events need to be reset by means of HMI Advanced, web-HMI, Scope or by switching off / on the power supply.*

List of alarm codes:

10 – alarm of external setpoint analog input

13 – manual mode enabled

16 – Modbus initialization error

17 – external air temperature sensor

18 – supply air temperature sensor

20 – room temperature sensor

22 – exhaust air temperature sensor

23 – air temperature sensor after the recovery unit

26 – air temperature sensor after the pre-heater

34 – anti-frost thermostat on the air side of water heater

35 – overheating protection of the electric heater

46 – fire alarm

48 – common filter contamination alarm

52 – fan motor overheat in VS 10-15

53 – fan motor overheat in VS 10-15

57 – chiller alarm

65 – communication lost for supply fan's frequency converters

66 – communication lost for exhaust fan's frequency converters

67 – frequency converter's alarm for supply fans

68 – frequency converter's alarm for exhaust fans

69 – frequency converter's alarm for rotary regenerator drive

70 – communication lost for RRG frequency converter

71 – second anti-frost thermostat on the water heater (water side)

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II. ADVANCED MANUAL

4. SERVICE MENU

Service menu is intended for service use, mainly at general startup of the AHU.

The whole menu is password protected and cannot be even viewed without logging-in.

VS 00 HMI Advanced EVO

ServiceMenu		
Unit configuration		
Frq converters configuration		
Universal IO configuration		

Configuration of the controller is the most important startup action, that influences the whole behavior of the controlled air handling unit. All the functionalities, like specific heaters or frequency converter types, are selected here. If not done properly, the controller will apply control algorithms not efficient and in worst case dangerous to the equipment.

For special service purposes, it is possible to restore pure factory-loaded program. Use Scope tool application and access via: Edit datapoints / Device / Diagnostic / member 0x0013 ApplicationDefault.

Note! *ENTIRE CONFIGURATION WILL BE LOST. THE CONTROLLER WILL RETURN TO FACTORY STATE WITH ALL SETTINGS SWITCHED TO DEFAULT VALUES.*

4.1. SERVICE MENU → UNIT CONFIGURATION

VS 00 HMI Advanced EVO

Unit configuration		
Controller mode		Config
Config stored		No
Control gear type		10-15
App.Code letter		AR
App.Code number		394
App.Code check		OK
HMI Basic		No
Main temp. sensor		Exhaust
Supply FC type		No FC
Supply multi-fan		No
Exhaust FC type		No FC
Exhaust multi-fan		No
Rotary reg. FC type		No FC
DX cooler type		2-stage
Doubled HW frost		Yes
HE monitoring mode		000
RRG belt check		Passive
Modbus IP Server		Passive

Controller mode – setting, whether the controller is in configuration or normal working mode

- **Config** (default factory state)
- **Running**

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Note! *The controller mode must be switched from Config to Running after completing all configuration settings in Unit Configuration and Frq Converters Configuration. If the AHU is equipped with FCs, configure them first.*

Config stored – shows if the config data was properly applied and stored to the controller.

- **No / Yes**

Note! *When switching from Config to Running mode, the controller makes 4 consecutive restarts. Be sure, that the power will not be broken down during that time (approx. 60 seconds). If so, the "Config store" will not change to "Yes". If that happened, then switch back to Config, check all the settings and change to Running again.*

Control gear type – setting for direct powered or frequency converter powered fan sets

- **10-15** – for VS10-15 untis, with 1-phase powered fans (default)
- **10-15.FC** – for VS10-15 units, where the fan sets are equipped with frequency converters
- **21-650.FC** – for ≥ VS21 units, where the fan sets are equipped with frequency converters

App.Code letter – first part of the main application code

- **AD** – for supply-exhaust units (default)
- **AG** – for S-E units with glycol heat recovery
- **AP** – for S-E units with plate cross-flow recuperator
- **AR** – for S-E units with rotary regenerator
- **AS** – for supply units

App.Code number – second part of the main application code – defined the internal parts of the AHU

- Range: 0..394
- Default: 0

App.Code check – indicates if letter-number combination is valid or not

- **OK / ERR**

HMI Basic – setting for enabling the HMI Basic communication

- **NO** – control system without HMI Basic
- **YES** – control system with HMI Basic, the interface screen indicates the real room temperature measured with its own sensor.
- **Yes.MTS** – control sstem with HMI Basic, the interface screen indicates the temperature value measured by the main sensor.

Main temp. sensor – setting for the temperature controllers. The signal from chosen sensor is compared to the reference for heating / cooling / recovery actions

- **Supply** (default)
- **Room**
- **Exhaust**

Supply FC type – selection of the frequency converter type for supply side

Exhaust FC type – selection for the exhaust side

- **No FC** – no frequency converters, the Modbus communication is disabled and don't trigger "communication lost" alarm message
- **LG iC5** – smaller FC from LG / LS Industrial Systems
- **LG iG5A** – larger FC from LG / LS Industrial Systems

Supply multi-fan – selection for the quantity of FC on the supply side

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Exhaust multi-fan – selection for the exhaust side
- **No** – only one FC on the side
- **Twin** – two FCs on the side
- **Triple** – three FCs on the side
- **Multi** – four FCs on the side

Note! *All the FC on one side have to be of the same type.*

FC type for supply can be different than for the exhaust.

The multi fan setting can be different for supply and exhaust side

Rotary reg. FC type – selection for the rotary regenerator's drive
- No FC
- LG iC5

DX cooler type – selection of the direct expansion unit type
- 1-stage
- 2-stage (default)

Note! *If 2-stage is chosen, two relays Q3 and Q4 are occupied to give the "cooling demand" signal to the DX unit. If 1-stage is chosen, only the Q3 is occupied and the other (relay Q4) can be user-defined e.g. as an alarm filter signal or unit start confirmation.*

Doubled HW frost – selection of the devices protecting the water heater
- **No** – single frost protection is enabled – by frost detector on the air side of the coil (input D1)
- **Yes** – (default) double protection is enabled – by frost detectors on the air side and water return side of the coil (inputs D1 and D2)

Note! If single frost protection is chosen, the digital input D2 can be user-defined e.g. as an external start signal

See the chapter "Universal IO configuration" for details

HE monitoring mode – selection of special functions for monitoring HE conditions. Those protective algorithms fit specially to the VTS electric heaters equipped with controls based on "HE Module".
- **Function 1** - normal behavior of the HE Module, when the AHU is switched off, is triggering the alarm. This happens due to lack of fan pressure confirmation from the differential pressure gauge. With Function 1 disabled – that alarm is ignored. With Function 1 enabled – controller checks the state of HE Module alarm after stopping the fans (see note). If the alarm is not present, the warning is displayed in the HMI Advanced.

  Note! This could indicate mechanical damage of the pressure gauge, sticky contacts or short circuit in the HE alarm loop.

  Note! In units with frequency converters, stopping the fans mean, that output frequency is less than 2Hz. in units without FC, checking is done approx. 30 seconds after taking the power off off the fan.
- **Function 2** - in normal conditions, the electric heater should always provide some reserve of the power. If the heat demand is not covered and the control signal for electric heater remains >99% for >6h then the warning will be displayed in the HMI Advanced.

  Note! This could indicate burned or broken heating elements or obstacles in the ducts – both causing not sufficient heat transfer to the room.
- **Function 3** - the differential pressure gauge, switches according to actual pressure in the fan section. If the conditions in whole ventilation system remain constant, that "switching point" should be at relatively similar fan speed. That can be monitored in AHUs equipped with frequency converters. The protective algorithm stores the value of switching point frequency each time, the AHU is started. After storing 10 values, the average is calculated and compared to the actual switching point. If the difference exceeds 30%, the warning is displayed in the HMI Advanced.

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Note! This could indicate mechanical wear to the differential pressure gauge.

Note! The average value of switching point frequency is restored after power loss.

Setting: bit coded combination (factory default 000)

Code	Function 1	Function 2	Function 3
000	-	-	-
001	-	-	active
010	-	active	
011	-	active	active
100	active	-	-
101	active	-	active
110	active	active	-
111	active	active	active

RRG belt check – selection for special sensorless monitoring algorithm to detect broken RRG belt.

- According to temperatures measured in the AHU and according to the AHU state, protective algorithm defines if there's demand for heat recovery (either for cooling or for heating stage) and then checks, if the recovery yield is high enough. If not, a warning will be displayed in the HMI Advanced.

  Note! That function triggers only a warning and does not block the operation of the unit.

  Note! In order to avoid false alarms in case of uncertain temperature measurements and changing conditions in the unit, the sensorless belt control is enabled with relevant time delay (10 minutes after AHU startup) in Comfort/Econo mode only and if the estimated temperature difference between air streams entering the rotor is at least 10°C

  Note! Available only for RRG with frequency converter.

  Setting:

- **Passive** (factory default)
- **Active**

Modbus IP Server – enables Server functionality over Modbus TCP/IP connection. Detailed description – see appendix. General settings for Ethernet port – see "System menu".

- **Passive** – Modbus IP disabled
- **Active** – Modbus IP enabled

  *Note! Available only in **WEB** control boxes.*

FREQUENCY CONVERTERS CONFIGURATION

VS 00 HMI Advanced EVO

Frq converters configuration	
Device function	Supply 1
Freq. conv. type	LG iC5
Motor power	0.09 kW
Motor poles	2p
Selection OK	No
FCConfig state	Ready

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Device function – setting for the place in the AHU, that the actual FC has got.

- **Supply 1** – 1st supply fan (Modbus address 2)
- **Supply 2** – 2nd (5)
- **Supply 3** – 3rd (7)
- **Supply 4** – 4th (9)
- **Exhaust 1** – 1st exhaust fan (3)
- **Exhaust 2** – 2nd (6)
- **Exhaust 3** – 3rd (8)
- **Exhaust 4** – 4th (9)
- **RRG** – rotary regenerator (4)

Note! *Bad selection will cause bad parameter setting and bad addressing in Modbus communication.*

Freq. conv. type – selection for the FC type

- **LG iC5**
- **LG iG5A**

Motor power – selection of motor type

- **0.09 kW**
- **0.18 kW**
- **0.37 kW**
- **0.75 kW**
- **1.1 kW**
- **1.5 kW**
- **2.2 kW**
- **3.0 kW**
- **4.0 kW**
- **5.5 kW**
- **7.5 kW**
- **11.0 kW**

Motor poles – selection of motor type

- **2p** – motors with rated approx. 2900 rpm
- **4p** – motors with rated approx. 1450 rpm

Selection OK – indicates, if the settings match each other and the configuration is possible to be implemented.

FCConfig state – setting and indication of current state of the FCConfig

- **Ready** – function in idle state, no errors
- **Send** – select that to start sending the parameters to the frequency converter.

  Note! "Send" will remain in the display, until the transmission will be finished. Then will switch back to "Ready" – if no errors occurred or will switch to "Error" – if anything was wrong during the transmission.

  Once you selected "Send" don't change it and wait until the controller does it automatically.
- **Error** – indicates that the last transmission failed

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In case of 2 or more frequency converters you should perform the following:

- select an appropriate FC from the list (supply 1, supply 2 or exhaust 1, exhaust 2 etc.), switch on the power supply of this FC only and connect the communication cable
- carry out the configuration of the frequency converter according to the description provided above
- connect the power supply and the communication cable to the next frequency converter and carry out its configuration
- repeat the procedure for the remaining frequency converters

4.2. SERVICE MENU → UNIVERSAL IO CONFIGURATION

The universal IO configuration allows fine tuning of the controls to specific demands of the end user. Hence, some additional non-standard functionalities are available.

Note! *As the availability of universal inputs and outputs depends on unit configuration, that part of settings has to be done after switching to Running mode*

VS 00 HMI Advanced EVO

Universal IO configuration		
Univ. bin. input 1		ExtCtrl.1
Univ. bin. input 2		ExtCtrl.2
Dig.inputs check		OK
Univ. analog input		TempSet.O
Univ. relay 1		StartConf
Univ. relay 2		UnivCtrl
Apply settings		

Univ. bin. input 1 – universal binary input 1

Possible functions

- No func. – no function, input disabled
- ExtCtrl.1 – external control input 1
- ExtCtrl.2 – external control input 2 – both are used for remote control of operating mode of the AHU. The functionality depends on combination of the inputs and the control gear type. See the details in the chapter “External control”
- Sum/wint – season selection switch – used in combi-coil applications, where one coil can be switched to heating in winter (fed from boiler) or to cooling in summer (fed from chiller). The selected season must correspond to the actual setup of the hydraulic valves.
- EmergStop – emergency stop – to force immediate stop of the AHU
- AlarmAck – alarm acknowledge – to cancel currently displayed alarms

  Note! *No need to enter the password*

- UnivCtrl – the input can enter the logic block of the Universal Controller, see the relevant chapter for details

Availability:

- all applicatios without glycol pre-heating coil

Univ. bin. input 2 – universal binary input 2

Possible functions:

- same as Univ.bin. input1

  Note! *Both inputs cannot carry the same function at a time*

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Availability:

- all applications without the doubled frost protection of water heater

Dig.inputs check – indicates same function selected for both universal binary inputs

Univ.analog input – universal analog input

Possible functions:

- No func. – no function, input disabled
- FreqSup.O – frequency scaling for supply fans, Ohm input - 0Ω = 0%, 2200Ω = 100%
- FreqExh.O – frequency scaling for exhaust fans, Ohm input
- FrequS-E.O – frequency scaling for supply and exhaust, Ohm input
- FreqSup.V – frequency scaling for supply fans, Volt input – 0V = 0%, 10V = 100%
- FreqExh.V – frequency scaling for exhaust fans, Volt input
- FrequS-E.V – frequency scaling for supply and exhaust, Volt input

  Note! *The frequency scaling signal affects the current valid setpoint from the program. Example: current fan stage: Stage 1 → original fan setpoint for Stage1 55% → frequency scaling: 80% → final setpoint with scaling: 55% x 80% = 44%*

  The final setpoint can never fall below the min. frequency configured for the frequency converter.
- TempSet.O – temperature setpoint, Ohm input – like Pt1000 sensor – 1000Ω = 0°C and rises proportionally 1°C with each ~3.9Ω
- TempSet.V - temperature setpoint, Volt input – 0V = -3°C , 10V = +3°C

  Note! *Value from the input is an offset to the original setpoint from the program. Example: Original setpoint: 21°C, offset from the input +2°C, final setpoint: 21+2 = 23°C*

  External temperature setpoint is ignored, when HMI Basic EVO is activated in the system.
- MixCmbr.O – Mixing chamber control, Ohm input – 0Ω = 0%, 2200Ω = 100%
- MixCmbr.V – Mixing chamber control, voltage input – 0V = 0%, 10V = 100%

  ATTENTION! *The level of recirculation is limited by the setting of minimum fresh air.*
- UniCtrl.O – input value for the universal controller, Ohm input - 0Ω = 0%, 2200Ω = 100%
- UniCtrl.V – input value for the universal controller, Volt input – 0V = 0%, 10V = 100%

Availability:

- all applications without glycol pre-heating coil

Univ. relay 1 – universal relay 1

Possible function

- No func. – no function, input disabled
- StartConf – start confirmation – unit set to any running mode including startup
- HeatgConf – heating rate >0
- CoolgConf – cooling rate >0
- RecovConf – recovery rate >0
- FiltAlarm – filter alarms triggered
- UnivCtrl – universal controller output
- UnivCtNOT – negated universal controller output

Availability:

- all applications without glycol pre-heating coil and without glycol heat recovery (application code AG)

Univ. relay 2 – universal relay 2

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Possible functions

- same as univ. relay 1

Note! *Both relays can carry the same function at a time*

Availability:

- all applications without the 2-stage DX cooling

Apply settings:

- **Yes** – triggers the sequence of 4 consecutive restarts to write the settings to relevant objects.

Note! *Be sure, that the power will not be broken down during that time (approx. 60 seconds). If so, check all the settings and set "Yes" again*

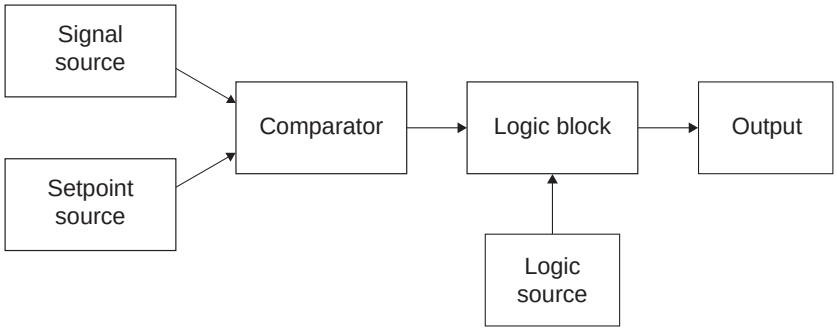
Note! *Each time the main Unit configuration is changed, check Universal IO configuration and apply the settings again.*

4.3. AHU MENU → UNIVERSAL CONTROLLER

The universal controller allows the use to implement some specific functionalities, that are not supported by original Ventus applications.

The structure of the universal controller contains of two main blocks:

- comparator – to check the relation between two signals (can be selected from the program variables or from universal analog input)
- logic block – the output from the comparator can be processed by a logic function with another binary value (from the program or from the binary input)
- the binary output – can do simple on/off control to external actuators via universal relay 1 or 2



VS 00 HMI Advanced EVO

UserProg		
44 < 50 AND Off = Off		
Signal source		MFAI
Compare function		Less
Setpoint source		Constant
Setpoint constant		50
Hysteresis		2.0
Logic Block		AND
Logic Source		MFDI 1

44 < 50 AND Off = Off – current status line, shows all Input values, all functions and resulting output

Signal source – select signal source to be compared with a reference in comparator block

- **MFAI –** multi-function analog input

- **SupplyTmp** – supply temperature [°C]
- **RoomTmp** – room temperature [°C]
- **ExhustTmp** – exhaust temperature [°C]
- **RecovrTmp** – temperature after the heat recovery unit [°C]
- **ExternTmp** – external temperature [°C]
- **HeatgRate** – heating rate [%]
- **CoolgRate** – cooling rate [%]
- **RecovRate** – heat recovery rate [%]
- **SupFnRate** – supply fan rate [%]
- **ExhFanRate** – exhaust fan rate [%]

Compare function – type of compare action
- **Less** – check if the source signal is less than the reference
- **Greater**
- **Equal**
- **True** – forces constant logical TRUE on comparator's output
- **False** – forces constant logical FALSE on comparator's output

Setpoint source – select the reference for comparator
- **MFAI** – multi-function analog input
- **Constant** – constant value set in following line

Setpoint constant
- Range: -100..100
- Default: 20

Hysteresis – set the hysteresis for comparator
- Range:0..100
- Default: 1.0

Logic Block – select type of logical operation
- **AND**
- **NAND**
- **OR**
- **NOR**
- **XOR**

Logic source – select logic signal source
- **MFDI 1** – multi-function digital input 1
- **MFDI 2** – multi-function digital input 2
- **StartConf** – start confirmation
- **HeatgConf** – heating confirmation
- **CoolgConf** – cooling confirmation
- **RecovConf** – heat recovery confirmation
- **InAlarm** – AHU in alarm
- **True** – constant TRUE
- **False** – constant FALSE

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EXAMPLE 1 – Fast heating

AHU configuration: PHC – plate cross-flow recuperator & heater & cooler – supported by standard Ventus application + additional mixing chamber intended for fast heating at startup and immediate temperature falls.
Base configuration of the controller: Application AP-37, main temperature sensor: Room, temperature setpoint: 21°C
Requested functionality: if main temperature falls below 15°C enable fast heating (close the mixing damper for 100% recirculation) and keep it closed until reaching 19°C
Additional condition: enable fast heating only when AHU is in heating mode

Settings for universal controller:

Signal source
- **RoomTmp**

Compare function
- **Less**

Setpoint source
- **Constant**

Setpoint constant
- **17°C**

Hysteresis
- **4**

Logic Block
- **AND**

Logic source
- **HeatgConf**

Note! *The universal relay 1 or 2 must be set to UnivCtrl – to let the resulting signal out of the controller.*

EXAMPLE 2 – Additional roof exhaust fan

Requested functionality: if supply fans run at more than 70% setpoint, turn on additional fan
Additional condition: additional fan's thermal protection is OK – multi-function digital input 1 is HIGH
Settings for universal controller:
Signal source
- **SupFnRat**

Compare function
- **Greater**

Setpoint source
- **Constant**

Setpoint constant
- **70%**

Hysteresis
- **1**

Logic Block
- **AND**

Logic source
- **MFDI 1**

Note! *The universal relay 1 or 2 must be set to UnivCtrl – to let the resulting signal out of the controller.*

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4.4 AHU MENU → LOOP CONTROLLERS

All the loop controllers in the program, can be accessed either via the functionality-oriented

AHU menu → Temperature control

or directly via the dedicated menu

AHU menu → Loop controllers

Note! *The loop controller screens are identical and give the same level of control over the settings.*

All the settings in the controllers are password protected.

Note! *The appearance of that menu depends on the AHU configuration and reflects those loop controllers that are actually enabled in the program.*

CASCADE CONTROLLER

Control output clg / htg – outputs for cooling / heating for the secondary controller (slave controller).

Present value – actual value of the controlled main temperature

Room setp. clg / htg – setpoints for the main temperature sensor

High limit

- Range: -64..99

Low limit

- Range: -64..99

Load compensation

- Range: -64..99

Enabled – indicates if the controller is currently active

Fault – indicates fault conditions (internal function of the controller)

Special settings – link to change the values:

- **Gain**

  Range: 0..1000

- **Integral action time**

  Range: 0..18000s

- **Min/max limit**

  Range: -64..99

RECOVERY CONTROLLER / HEATING CONTROLLER / COOLING CONTROLLER / RECIRCULATION CONTROLLER/ FROST PROTECT. FOR RECOVERY

Control output – actual output signal

VS 00 HMI Advanced EVO

Loop controllers			
Cascade controller			
15.0°C	15.0°C		
Recovery controller		100	%
Heat rec. frost protection		0	%
Heater controller		0	%
Cooling controller		82	%
Pre-heater controller		0	%

Cascade controller		
Control output clg	15	
Control output htg	15	
Present value	29.3	
Room setp clg	22	
Room setp htg	20	
High limit	25	
Low limit	15	
Load compensation	-2	
Enabled	Active	
Fault	Passive	
Special settings		▶

Cascade controller		
Gain	2.00	
Int action time	0	s
Min/max limit	0.0	

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Present value – actual value of the controlled main temperature

Setpoint – actual setpoint

Enabled – indicates if the controller is currently active

Fault – indicates fault conditions (internal function of the controller)

High limit / Low limit – default limits applied to the output signal

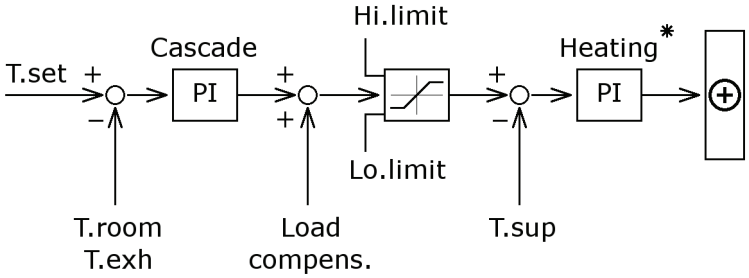
Special settings – link to change the values:

- **Gain**
  Range: -1000..1000
- **Integral action time**
  Range: 0..18000s
- **Derivative acttime**
  Range: 0..18000s

Recovery controller		
Control output	100	%
Present value	32.9716	
Setpoint	15	
Enabled	Active	
Fault	Passive	
High limit	100	%
Low limit	0	%
Special settings		▶

Recovery controller		
Gain	10.00	
Int action time	120	s
Derivative acttime	0	s

CASCADE CONTROLLER EXPLANATION



** - The same layout is applied for cooling algorithm. They can be considered as separate cascade loops, as they are separated with a deadzone.*

4.5. AHU MENU → FANS → SUPPLY FAN / EXHAUST FAN → SETPOINTS/SETTINGS

Actual fan step – indicates actual fan speed selection – Off / Stage1 / Stage2

Act. fan setpoint – indicates actual fan rate, corresponding to the fan step

Stage 1 setp. – fan rate setpoint corresponding to the 1st fan step

- Range: 0..100%
- Default: 50%

Stage 2 setp. – fan rate setpoint corresponding to the 2nd fan step

- Range: 0..100%
- Default: 100%

Note! *The fan rate settings cannot exceed Freq. low / high limit settings. If so, they are corrected automatically.*

Min run time – setting for the min. running time

Switch on delay – setting for delayed start of the supply fans (not available for exhaust fans)

VS 00 HMI Advanced EVO

Supply setpoints		
Actual fan step	Stage1	
Act. fan setpoint	50	%
Stage 1 setp.	50	%
Stage 2 setp.	100	%
Min run time	0	sec
Switch on delay	30	sec
Freq. low limit	30	Hz
Freq. high limit	60	Hz
Ramp up	45	s
Ramp down	45	s

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Freq. low limit – setting for lower frequency limit
- Range: 20..100Hz
- Default: 30Hz

Freq. high limit – setting for upper frequency limit
- Range: 20..100Hz
- Default: 60Hz

Ramp up / Ramp down – settings for acceleration and deleceleration times
- Range: 30..120s
- Default: 45s

4.6. AHU MENU → OPERATING MODE → EXTERNAL CONTROL

Actual Temp-Fan – indicates actual temperature control mode and fan control mode combination
1. Full auto – both are controlled automatically, e.g. from the calendar
2. Comf – St1
3. Comf – St2
   temperature in comfort mode, fans – Stage1 or Stage2
4. Eco – St1
5. Eco – St2
   temperature in economy mode, fans – Stage1 or Stage2

Temp. setp. input 1 – setting for activated temperature control mode
- Range: **Comfort / Economy**

Temp. setp. input 2 – setting for activated temperature control mode
- Range: **Comfort / Economy**

Off delay – the inputs can be a “pushbutton” type, so they are stored for the specified time.
- Range: 0..24h

Note! *The “temporary occupation” functionality can be done with off delay function. The calendar settings can be overridden for the specified time, e.g. 2 hours from pressing the button.*

Fan step – setting for the max. available fan step
- Range: 1Step / 2Step

VS 00 HMI Advanced EVO

Option 1 – single input configured as External Control 1

External control	
Actual Temp-Fan	Full auto
Temp. setp. input 1	Comfort
Off delay	0.0 hrs
Fan step	1Step

Option 2 – two inputs configured as External Control 1 / 2

External control	
Actual Temp-Fan	Full auto
Temp. setp. input 1	Comfort
Temp. setp. input 2	Economy
Off delay	0.0 hrs
Fan step	1Step

Possible configurations and unit behavior
Option 1 – single input configured as External Control 1

	Temp. setp. input 1	
Fan step	Comfort	Economy
1Step	0: Full auto 1: Comf-St1	0: Full auto 1: Eco-St1
2Step	0: Full auto 1: Comf-St2	0: Full auto 1: Eco-St1

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Option 2 – two inputs configured as External Control 1 / 2

	Temp. setp. intput 1 / Temp. setp. input 2			
Fan step	Comfort / Comfort	Comfort / Economy	Economy / Comfort	Economy / Economy
1Step	0-0: Full auto 1-0: Comf-St1 0-1: Comf-St1 1-1: Comf-St1	0-0: Full auto 1-0: Comf-St1 0-1: Eco-St1 1-1: Comf-St1	0-0: Full auto 1-0: Eco-St1 0-1: Comf-St1 1-1: Comf-St1	0-0: Full auto 1-0: Eco-St1 0-1: Eco-St1 1-1: Eco-St1
2Step	0-0: Full auto 1-0: Comf-St1 0-1: Comf-St2 1-1: Comf-St2	0-0: Full auto 1-0: Comf-St1 0-1: Eco-St2 1-1: Comf-St2	0-0: Full auto 1-0: Eco-St1 0-1: Comf-St2 1-1: Comf-St2	0-0: Full auto 1-0: Eco-St1 0-1: Eco-St2 1-1: Eco-St2

4.7. AHU MENU → OPERATING MODE → STANDBY TEMP. CHECK

Night cooling and Standby functions rely on room temperature. If there's no temperature measurement in the room, the exhaust duct sensor is taken into account and gives the readout. This requires turning on the fans to refresh the air and have appropriate room temperature value on that sensor.

Temperature check – select mode

- **Passive** – function disabled
- **Active** – function enabled

Fixed time – operates with real time clock, triggers Night Kick operation each day at specified time

Note! *Set *:* to disable that option.*

Interval – triggers Night Kick each specified period of time

Note! *Set 0.0 to disable that option.*

Time on – specifies the time duration of Night Kick operation

Note! *If during the Night Kick operation, conditions for Night Cooling or Standby will be detected, the unit will automatically switch to another relevant mode.*

VS 00 HMI Advanced EVO

Standby temp. check			
Fixed time		*:*	
Interval		0.0	hrs
Time on		90	sec

4.8. AHU MENU → OPERATING MODE → NIGHT COOLING

Room temp. hyst. – room temperature hysteresis, the Night Cooling operation starts when room temperature is higher than room setpoint + Room temp. hyst.

On difference – difference between the room and the external temperature, at which the night cooling starts

Min. out temp – night cooling function is disabled below that temperature

Min. run time – min. working time for the nigh cooling

VS 00 HMI Advanced EVO

Nigth cooling			
Room temp. hyst.		3.0	°C
On difference		5.0	°C
Min. out temp.		12.0	°C
Min. run time		30.0	min

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4.9. AHU MENU → OPERATING MODE → STANDBY SETTINGS

Cooling start – temperature at which the cooling is activated

Cooling setpoint – temperature at which the cooling is turned off

Heating start – temperature at which the heating is activated

Heating setpoint – temperature at which the heating is turned off

Min. restart time – min. resting time after working in standby mode

Min. running time – min. running time in standby mode

VS 00 HMI Advanced EVO

Standby settings			
Cooling start		30.0	°C
Cooling setpoint		20.0	°C
Heating start		15.0	°C
Heating setpoint		25.0	°C
Min. restart time		30.0	min
Min. running time		0.0	min

4.10. AHU MENU → TEMPERATURE CONTROL →...→ PREHEATING

Status – current state of the preheating function

X1 – lower scaling external temperature
X2 – upper scaling external temperature
Y1 – heating rate at X1 temperature
Y2 – heating rate at X2 temperature

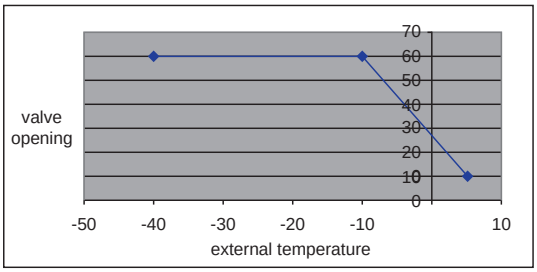
Time force 100% – time to force the valve to 100% opening, regardless to the external temperature, in order to fill the pipeline with the hot water

Time pre-heating – time the unit stays with calculated heating rate

Note! *Total time is* ***Time force 100% + Time pre-heating***

VS 00 HMI Advanced EVO

Preheating		
Status	Off	
X1	-10.0	°C
X2	5.0	°C
Y1	60.0	%
Y2	10.0	%
Time force 100%	60	sec
Time pre-heating	2.0	min



4.11. AHU MENU → TEMPERATURE CONTROL →...→ COOLING DX

DX cooler state – indicates the current state of the DX cooler: Off / Stage1 / Stage2

Alarm – indicates the current state of the alarm input

Min. run time – setting for the min. working time for each stage

Min. off time – setting for the min. resting time for each stage

Min. stage time – setting for the min. working time before switching to the other stage

Start stage 1 / Start stage 2 / Stage hysteresis – settings for the relation between cooling controller and DX stages

VS 00 HMI Advanced EVO

Cooling DX		
DX cooler state	Off	
Alarm	OK	
Min. run time	60	sec
Min. off time	120	sec
Min. stage time	180	sec
Start stage 1	20	%
Start stage 2	40	%
Stage hysteresis	10	%

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4.12. GENERIC SCREENS

Heating rate / Cooling rate / Recovery rate

Present value – actual value on the output

Reliability – indicates the hardware functionality (internal function of the controller)

VS 00 HMI Advanced EVO

Heating rate			
Present value		0	%
Reliability			OK

Temperature inputs

Present value – actual value on the input

Reliability – indicates the hardware functionality (internal function of the controller)

Sensor correction – offset to correct the stable additive error, e.g. from very long sensor cable

PT1 filter HW – low-pass filter time constant

VS 00 HMI Advanced EVO

Exhaust temp.			
Present value		29.4	°C
Reliability		OK	
Sensor correction		0	dK
PT1 filter HW		0.0	s

Binary inputs / Binary alarms

Present value – actual value

Note! *Some alarms are remanent and stay active until acknowledged. Those alarm can indicate OK regardless to the state of the hardware input.*

Reliability – indicates the hardware functionality (internal function of the controller)

Time delay – time between triggering the input and transferring the alarm to the program.

Note! *Delaying alarms can be very dangerous for the equipment and the people.*

VS 00 HMI Advanced EVO

Fire alarm			
Present value		OK	
Reliability		OK	
Time delay		10	s

Digital outputs

Manual operation – override the output

- NULL – cancel override
- other states – select to force the output, values depend on the output and are different for fans, dampers, pumps, etc.

Note! *For states different from NULL, an alarm is triggered, the HMI operating mode is forced to Off and AHU cannot be started. Manual mode is intended only for testing purposes.*

Present value – actual state

- OK / Alarm
- Off / On
- Off / Stage1 / Stage2

VS 00 HMI Advanced EVO

Pre-heater pump			
Manual operation		NULL	
Present value		On	
Reliability		OK	
Operating hours		12	h
Operating (Reset)		640	s
			Last op hours reset
			Tu , 31.08.2009 07:52:04

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Note! *If fan sets are FC-powered, the outputs don't refer to any hardware relays, but are transmitted as a start command via Modbus line.*

Reliability – indicates the hardware functionality (internal function of the controller)

Operating hours – indicates the operating time from the last reset

Operating (Reset) – setting, enter "0" to restart the clock

Last op hour reset – indicates when the last clock reset was done.

Analog outputs

Manual operation – override the output

- **0.0%** – cancel override
- **>0.0%** – selected value will be transferred to the hardware output

Note! *For any overridden states, an alarm is triggered, the HMI operating mode is forced to Off and AHU cannot be started. Manual mode is intended only for testing purposes.*

Note! *Some safety interlocks can block dangerous settings, e.g. driving the heater when the fans are not running.*

Always observe the unit for unintended unsafe operation when using manual mode!

Present value – actual output value

Note! *If fan sets are FC-powered, the outputs don't refer to any hardware, but are converted to Hz value and transmitted via Modbus line.*

Reliability – indicates the hardware functionality (internal function of the controller)

VS 00 HMI Advanced EVO

Sup. fan output signal		
Manual operation	0	%
Present value	50	%
Reliability	OK	

5. SYSTEM MENU

PL / EN / RU – language selection

Program info – indicates the version of the program and the HMI templates, specifies the oldest compatible operating system

Communication – shows the overview of TCP/IP, USB and Modbus properties

- **TCP/IP** – allows for changing the protocol settings and the login data

  Note! *When accessing the TCP/IP link a login and password must be given*

- **USB** – shows the name of the controller that is displayed in scope when connected via USB

VS 00 HMI Advanced EVO

System menu	
3.9.2009 8:23:49	
PL / EN / RU	▶
Program info	▶
Communication	▶
Controller	▶

EN

- **Modbus** – shows the settings for Modbus link
  Default settings:
  - Function – Master
  - Baudrate – 9600
  - Parity – None
  - Stop bit – One
  - Response delay – 0.0

  Note! *Those parameters should not be changed, as they have to match the settings in frequency converters*

  Termination – switch for internal terminating resistor

  Communication reports – detailed indication of Modbus slave states. Only for special service purposes.
- **Controller** – shows the operating system version and other controller and application related details – only for special service purposes.

COMMUNICATION REPORTS – DETAILS

Each communication report consists of two lines.

First line gives general data:

- slave type
- slave address
- cycle time for communication in miliseconds (example: 1653ms means, that each 1653ms all data for that slave device is refreshed)

Second line gives detailed response from the application for each specific transmission. There are 6..8 transmissions performed for each slave device. If no errors occur, all states are zero. Not used items are marked with “13”

Example:
2;VLT;923ms
0;0;0;0;0;0;0;13.

Meaning:
slave device VLT2800, addressed as device 2, with 923ms full refresh time, seven parameters exchanged without errors (=0), the eight field not used (=13)

Note! *The reports are string values and are not refreshed in the real time on the HMI Advanced. To refresh the data, escape from the screen and enter it again.*

Note! *If the report is currently refreshed, you will see “...” in the screen.*

Note! *In normal conditions, without any errors across all the slaves, the refresh times are from approx. 1000ms to approx 2500ms.*

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Error code definitions:

- 0 – no error
- 1 – internal error
- 2 – driver error
- 3 – application error
- 4 – bad parameter
- 5 – too many slaves
- 6 – bad handle
- 7 – address out of range
- 8 – unsupported Modbus function
- 9 – illegal Modbus register
- 10 – Modbus BCC error
- 11 – communication timeout
- 13 – data field not used
- 0x4001 – from Slave – unsupported Modbus function
- 0x4002 – from Slave – incorrect start address
- 0x4003 – from Slave – data overflow
- 0x4004 – from Slave – data unavailable

6. CONTROL ALGORITHMS

OPERATING MODE

The unit can be controlled from several sources and the priorities between them has got significant influence on the behavior of the AHU.

Note! *The "zero priority" is reserved for important protective functions like fire alarm. Events of that kind disable all other controls to protect life and property.*

HMI Advanced EVO – the main and the most capable interface has got the highest priority. Choosing any mode other than Auto causes blocking all the other control sources. The unit will work continuously in selected mode.

The mirror of the HMI Advanced EVO is available via the **web-server**. All the functionalities of original device can be accessed with the web-browser on a PC-computer. The priority of that virtual web-HMI is equal to the original device and if both are active at a time, one overwrites the settings of another and vice-versa.

Note! *Selecting Off in the HMI Advanced blocks the unit. Only protective functions like frost protection are activated.*

To enable any control source of lower priority, the HMI operating mode must be set to Auto.

External control inputs – those are configurable binary inputs available for the user depending on the complexity of the control application. Most applications allow for one binary input. The second binary input can be configured instead of doubled frost protection for water heater.

Note! *The most complicated control applications, like supply-exhaust unit with heater, cooler, RRG and pre-heating coil, have already occupied all inputs and external control with binary signals could be impossible.*

The control mode resulting from external inputs overrides all the settings from the calendar and HMI Basic EVO

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HMI Basic EVO – it is a device with lower priority. HMI Basic can overwrite any operation mode from the calendar (time schedule).

Example: HMI Advanced set to Auto, the Calendar is set to the Comf.1st - HMI Basic can make any alterations to the temperature mode (Comf. / Econo.) as well as the fan's rotation or can force stoppage of the AHU.

If in the meantime HMI Advanced is set to another mode and then back to the Auto mode all relations between HMI Basic and the Calendar will be reset and the HMI Basic's settings will be lost.

Settings of HMI Basic are not restored after undervoltage. In such a situation calendar settings are applied.

Calendar – lowest priority control source available for the user. If HMI Advanced is set to Auto and no other control sources are activated, the unit will work according to specified time schedule.

Economy and protection functions – those the least prioritized automatic functions, activated when the HMI Advanced is set to Auto and all other control sources are Off. Those functions are Night Nooling and Standby.

Night cooling – checks the external temperature readout and if the air outside the building is colder than the room setpoint, the fans are turned on in order to cool down the building, the walls and equipment inside. That allows for energy saving by not using the cooler in the morning time.

Standby – checks the deviation of controlled temperature and if it goes too much away from desired value, the unit is turned on to cool down or heat up the room – to stay within the specified range. That functionality protects the building and the appliances inside from too big temperature amplitudes across the day.

STARTUP SEQUENCE

The startup sequence ensures proper order of enabled functions. The main startup operations are:

1. **Power up delay** – the timer that delays the startup of the unit after switching on the power. That delay gives time for all devices for reaching stable initial state (e.g. frequency converters and communication)
2. **Preheating** – function of initial heat-up of the water coils in wintertime, according to specified timers and valve opening rate. The preheating disables the fans and dampers until finished.
3. **Damper opening** – has fixed delay of 20 seconds between the opening signal and startup of the fans and enabling other control features (like temperature control etc.)
4. **Fans ramp-up time** – specifies the rate of acceleration for the fans.

Note! *Some alarm events can block the startup of the unit.*

COOLING / RECOVERY / HEATING

Applied signals:

1. Temperature measurements
2. Alarm signals
3. Outputs for actuators

The purpose:
Heat exchangers in the AHU cooperate to keep the temperature in specified range. Two separate ranges can be defined for economy mode and for comfort mode – each with own setpoint and the deadzone. The range is defined as the setpoint ± ½ deadzone.

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Example:

- comfort setpoint: 21°C, deadzone: 2°C → resulting range: 20..22°C
- economy setpoint: 20°C, deadzone: 6°C → resulting range: 17..23°C

The ranges are selected depending on the current operating mode of the controller. If the actual temperature is within the range – the unit will remain in current state – so the cooling / recovery / heating signals will stay in equilibrium. If the actual temperature is above the range – the unit will increase in cooling. If it's below the range – the unit will increase in heating. What should be noted, the first sequence of cooling / heating is performed by the heat recovery unit to maximize the utilization of the energy generated in the building. If the recovery capacity is not enough, then the cooler or heater starts to operate to supply more energy to the unit.

Note! *The recovery can be active together with cooling or with heating sequence. However, the cooling and heating cannot be active at a time under any circumstances.*

The recovery for heating is active by default. For cooling this must be activated by specific application code number.

Protective functions:

1. Min/max supply air temperature
   If the main temperature sensor is selected room or exhaust, the supply temperature is controlled against over-heating or over-cooling. This could seriously affect the comfort of the people in the room. The min/max controller has higher priority than main temperature control loop.
2. Cooling sequence is protected with chiller / DX unit – uses binary alarm input. If activated: the AHU remains working, but the cooling demand relays are turned off
   Doesn't need to be acknowledged, the alarm is of non-remanent type
3. Recovery sequence is protected against freezing
   If the temperature measurement in the exhaust duct after the recovery unit, fall below the specified protection setpoint, the rate of the recovery is being reduced. The reduction is controlled by PI controller, so it is always the least necessary value to protect the recovery unit, but without excessive degrading the recovery efficiency. The recovery protection does not affect the AHU operation. All other devices continue to work even if the recovery rate is reduced to 0% by protective functions.
4. Heating sequence
   a. Preheating – is a start-up feature enabled in winter, to avoid passing cold air to the room and to avoid activating the water heater frost protection at start-up. The specified time and valve opening characteristic is applied in order to properly heat-up the coil and the coil compartment before starting the fans.The startup of the AHU is blocked until the preheating is finished.
   b. Frost protection on the air side – uses a digital alarm input to connect the frost detector. If activated, the fans are stopped, dampers closed and the valve is forced to open at full 100% heating rate. After the detector switches back to normal mode, the startup of the AHU is performed again.

      Note! *The automatic release of the frost protection on the air side can be done max. 3 times per hour. If that happens more often the controller is locked in stop mode and the AHU cannot be started until fixing the malfunction and acknowledge the alarm.*

      Note! *The counter is disabled if the AHU is in Off mode, e.g. stopped for the night. The frost protection will work continuously just to protect the coil and ensure proper temperature in coil's compartment.*

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c. Frost protection on the water return side – uses a digital alarm input to connect the frost detector. If activated, the fans are stopped, dampers closed and the valve is forced to open at full 100% heating rate. After the detector switches back to normal mode, the startup of the AHU is performed again.

Note! *This alarm is always automatic – release.*

d. Pump kick – is a timer to turn on the pump for the very short period of time, to prevent it from sticking and damaging the sealing.

e. Pump min. out temperature – turns on the pump for constant working if the external temperature falls below the specified limit – regardless of heating rate.

f. Overheating protection for the electrical heater

Note! *The automatic release of the overheating protection can be done max. 3 times per hour. If that happens more often the controller is locked in stop mode and the AHU cannot be started until fixing the malfunction and acknowledge the alarm*

5. Additional protective algorithms:

a. 3 protective functions for electric heater and HE alarm reliability

b. Sensorless belt control for rotary regenerator

Note! *Refer to Unit Configuration for details.*

EN

7. TECHNICAL DATA

Control gear

Construction

- Casing with external mains switch and RJ45 port for connecting the VS 00 HMI Advanced EVO control panel

Main internal elements:

- short-circuit and overload protection assemblies
- connection units
- ACX36 EVO controller

Weight	**VS10-15 CG ACX36 EVO (WEB)**	**VS21-150 CG ACX36 EVO... VS180-300 CG ACX36 EVO...**	**VS400-650 CG ACX36 EVO...**
	10kg	10kg	10kg
Dimensions	450x460x170	450x460x170	450x640x170
OPERATION PARAMETERS			
Parameter	**VS10-15 CG ACX EVO**	**VS21-150 CG ACX36 EVO... VS180-300 CG ACX36 EVO... VS400-650 CG ACX36 EVO...**	
system	TN		
U3 rated power supply voltage	1x230V	3x400V	3x400V
In control box rated current	VS10-15 CG ACX36 EVO (WEB): 22 A VS21-150 CG ACX36 EVO (WEB) SUP: 28 A VS21-150 CG ACX36 EVO (WEB) SUP-EXH: 49 A VS180-300 CG ACX36 EVO (WEB) SUP-EXH: 91 A VS400-650 CG ACX36 EVO (WEB) SUP-EXH: 175 A		
Ui rated insulation voltage	400 V		
Uimp rated impulse withstand voltage	2.5 Kv		

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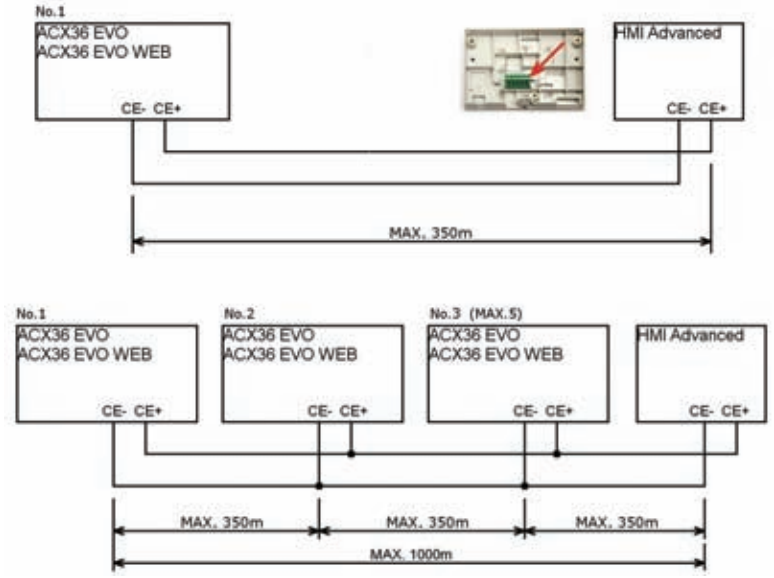
rated short-time withstand current Icw for respective circuits – effective value of alternating currentcomponent withstood during 1 second, i.e.: short-circuit current expected at rated connecting voltage	6 kA
rated peak withstand current (ipk) at cosφ= 0.5	10.2 kA
rated short-circuit current	6 kA
coincidence factor	0.9
rated frequency	50 Hz ± 1Hz
protection class	IP54
acceptable operating temperature	0 ÷ 40 °C
supply voltage of control circuits	24 V AC
EMC environment	1
PARAMETERS OF PROTECTION UNITS	
F1 (B6)	Protection of lighting circuit
F1M (C16)	Protection of power supply circuit of water heater pump and rotary exchanger (for VS 21-150 CGACX36 EVO SUP, VS 21-150 CG ACX36 EVO SUP-EXH, VS 180-300 CG ACX36 EVO SUP-EXH and VS400-650 CG ACX36 EVO SUP-EXH)
F1M (C10)	Protection of supply circuits of water heater pump (for VS 10-15 CG ACX36 EVO)
F2	Glass or ceramic fuse element of size 5x20mm, type T 0,63A
ACX36 EVO CONTROLLER	
RESOURCES	
Relay outputs Q1..Q6	
Universal inputs/outputs X1..X8	Reference potential G0; Inputs DC 4...20mA, DC 0-10V, Pt 1000, Ni 1000, NTC Outputs, DC 0-10V (1mA)
Digital inputs D1..D5	DC 16V(5mA) max 50Hz
Analog outputs Y1..Y2	0...10V, max (2mA)
RS485 communication port (T9)	Modbus protocol, 1200m
PB communication port (T8)	2-wire link based on KNX TP1 specifications Standard port for HMI Basic, max.700m Optional use: multiple connection of controllers to single HMI Advanced  Max. count of controllers: 5 Max. count of HMI Advanced: 1 ***Note!*** *Connecting any HMI Basic is not allowed in that case!*

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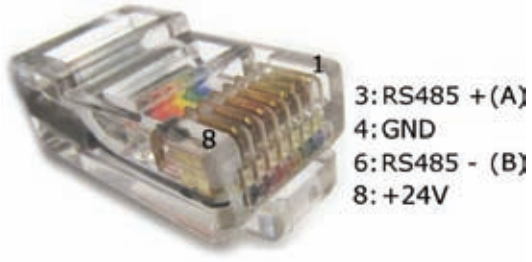
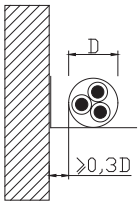
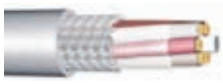
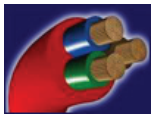
USB communication port (T-SV)	Standard USB “slave” socket
Ethernet communication port (T-IP)	RJ45 socket 10/100 MBit (IEEE 802.3U) Capable of: ▪ Web-HMI emulation via Internet browser ▪ Scope connections via port 4242 ▪ Modbus TCP/IP Server functionality via port 502 (datapoints specified by the end of that manual)
HMI Advanced omm.. port (T-HI)	Serial link over RS485 connection Standard connection – factory supplied flat cable, 3m long For remote locations, HMI Advanced EVO requires separate power supply of 24V DC 100mABoth, communication and power supply can be connected via dedicated connector in the baseplate. 

8. CABLING



Connect power leads of the control gear and frequency converter of the fan drive according to the Electric diagram. The wire cross-sections have been selected for long term current capacity for cables arranged in the air (supported on brackets, cable racks, in perforated trays) with spacing from the wall of min. 0.3 cable diameter, insulated with PVC, for 3-conductors loaded. Due to the protection selectivity, length, cable placement method and short-circuit currents, revise the feeders’ cross-sections in the table below.

Wire type	Wire picture	Wire description	Parameters
[1]		Control wires with copper cores with a shield. PVC isolation.	Nominal voltage: 300/500 V Ambient temperature: -30 to 80°C
[2]		Copper cores. PVC isolation.	Nominal voltage: 450/750V Ambient temperature: from –40 to 70°C
[3]		Copper cores. PVC isolation.	Nominal voltage: 150 V Ambient temperature; -20… 60°C
[4]		Flat communication cable without shield	Nominal voltage 150V Ambient temperature: -20… 60°C

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Name of element / connection point	1-phase control gear	3-phase control gear	Wire type	Section [mm²]
control gear	VS10-15 CG ACX EVO	VS21-150 CG ACX36 EVO... VS180-300 CG ACX36 EVO... VS400-650 CG ACX36 EVO...	[2]	TAB A
controller	N1	N1	-	-
fire alarm switch	S1F	S1F	[2]	2x0,75
multi-function switch	S6	S6	[2]	2x0,75
optional multi-function switch	S7	S7	[2]	2x0,75
supply air temperature sensor	B1	B1	[1]	2x0,75
room/ exhaust air temperature sensor	B2	B2	[1]	2x0,75
external air temperature sensor	B3	B3	[1]	2x0,75
after recovery air temperature sensor	B4	B4	[1]	2x0,75
multi-function analog reference	B5	B5	[1]	2x0,75
air temperature after glycol pre-heater	B6	B6	[1]	2x0,75
HW anti-frost water side thermostat	S3F	S3F	[2]	2x0,75
HE alarm switch	VTS-E-0005ter. 22:23	VTS-E-0005ter. 22:23	[2]	2x0,75
HW anti-frost air side thermostat	S2F	S2F	[2]	2x0,75
glycol pre-heater anti-frost thermostat	not supported	S6F	[2]	2x0,75
HW analog controlled valve	Y1	Y1	[1]	3x0,75
HE power rate control input	VTS-E-0005ter. 15:21	VTS-E-0005ter. 15:21	[1]	3x0,75
HW circulating pump contactor	M1	M1		3x1,5
chiller / refrigerating unit / heat pump alarm switc	S5F	S5F	[2]	2x0,75
chiller start input	E1	E1	[2]	2x0,75
refrigerating unit start input – I stage	E2.1	E2.1	[2]	2x0,75
refrigerating unit start input – II stage	E2.2	E2.2	[2]	2x0,75
CW analog controlled valve	Y2	Y2	[1]	3x0,75
RHE frequency converter	not supported	U1	[1] [2]	3x1,5 / 4x1,5
RHE alarm switch	not supported	via Modbus comm..	[3]	UTP 2x2
RHE start input	not supported	via Modbus comm..		
RHE speed reference input	not supported	via Modbus comm..		
recirculation damper actuator	Y3	Y3	[1]	3x0,75

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Name of element / connection point	1-phase control gear	3-phase control gear	Wire type	Section [mm²]
cross-flow bypass actuator	Y4	Y4	[1]	3x0,75
CWHW analog controlled valve	Y5	Y5	[1]	3x0,75
glycol pre-heater analog valve	not supported	Y6	[1]	3x0,75
glycol heat recovery analog valve	not supported	Y7	[1]	3x0,75
CWHW “cooling” command	E3.1	E3.1	[2]	2x0,75
CWHW “heating” command	E3.2	E3.2	[2]	2x0,75
AHU alarm	E4	E4	[2]	2x0,75
AHU start confirmation (configurable)	E5	E5	[2]	2x0,75
start signal for the circulation pump of the glycol pre-heater	not supported	E6	[2]	2x0,75
start signal for the circulation pump of the glycol heat recovery	not supported	E7	[2]	2x0,75
AHU start confirmation (configurable)	E8	E8	[2]	2x0,75
HMI Basic EVO – reduced function interface	N2	N2	[3]	UTP 1x2
HMI Advanced EVO – full function interface	N3	N3	[4]	8x0,1
supply elements				
pressure control - primary filter, supply	1S1H	1S1H	[2]	2x0,75
pressure control - primary filter, supply	1S2H	1S2H	[2]	2x0,75
pressure control - compression monitoring for HE-Module	1S3H	1S3H	[2]	2x0,75
supply motor protective relay	1M1F	not supported	[2]	2x0,75
supply motor contactor	1M1	not supported	[2]	2x0,75
supply frequency converter	not supported	1U1	[1] [2] [3]	TAB A UTP 2x2
second supply fan frequency converter	not supported	1U2	[1] [2] [3]	TAB A UTP 2x2
frequency converter of the third supply fan	not supported	1U3	[1] [2] [3]	TAB A UTP 2x2
frequency converter of the fourth supply fan	not supported	1U4	[1] [2] [3]	TAB A UTP 2x2
intake damper actuator	1Y1	1Y1	[2]	3x0,75
exhaust elements				
pressure control - primary filter, exhaust	2S1H	2S1H	[2]	3x0,75
exhaust motor protective relay	2M1F	not supported	[2]	2x0,75
exhaust motor contactor	2M1	not supported	[2]	2x0,75
exhaust frequency converter	not supported	2U1	[1] [2] [3]	TAB A UTP 2x2
second exhaust fan frequency converter	not supported	2U2	[1] [2] [3]	TAB A UTP 2x2
frequency converter of the third exhaust fan	not supported	2U3	[1] [2] [3]	TAB A UTP 2x2
frequency converter of the fourth exhaust fan	not supported	2U4	[1] [2] [3]	TAB A UTP 2x2
outlet damper actuator	2Y1	2Y1	[2]	3x0,75

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Table A

Motor rated power	Motor rated current	FC protection	FC supply cable	Motor cable	Control gear power supply cable		Control gear rated current	
[kW]	[A]		[mm²]	[mm²]	[mm²]		[A]	
3x230V / 50Hz		1x230V / 50Hz			supply AHU	supply-exhaust	supply AHU	supply-exhaust
0,55	2,5	gG10	3x1,5	4x1	5x1,5	5 x TABLE C	4 / 1,5 / 7	TABLE B
0,75	3,0	gG10	3x1,5	4x1,5	5x1,5		5 / 1,5 / 7	
1,1	4,5	gG10	3x1,5	4x1,5	5x1,5		7 / 1,5 / 7	
1,5	6,0	gG20	3x2,5	4x1,5	5x2,5		8 / 1,5 / 7	
2,2	8,0	gG20	3x2,5	4x1,5	5x2,5		11 / 1,5 / 7	
3x400V / 50Hz		3x400V / 50Hz						
3,0	6,0	gG16	4x1,5	4x1,5	5x1,5		8 / 7,5 / 13	
4,0	8,0	gG16	4x1,5	4x1,5	5x1,5		10 / 9,5 / 15	
5,5	11,0	gG20	4x2,5	4x2,5	5x2,5		13 / 12,5 / 18	
7,5	15,0	gG20	4x2,5	4x2,5	5x2,5		17 / 16,5 / 22	
11,0	21,0	gG25	4x4	4x4	5x4		23 / 22,5 / 28	
1x230V / 50Hz								
0,3	2,4	-	-	3x1	3x1,5	3 x TABLE C	9	TABLE B
0,5	4,8	-	-	3x1,5	3x1,5		11	

EN

Table B

Motor power [kW]	0,55kW			0,75kW			1,1kW			1,5kW			2,2kW			3kW			4kW			5,5kW		
	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
0,55	4,0	5,5	7,0																					
0,75	4,0	5,5	7,0	6,5	7,0	7,0																		
1,1				6,5	11,5	7,0	8,0	8,5	7,0															
1,5				6,5	13,0	7,0	8,0	10,0	7,0	9,5	10,0	7,0												
2,2				6,5	15,0	7,0	8,0	12,0	7,0	9,5	12,0	7,0	11,5	14,0	7,0									
3				12,5	10,0	13,0	14,0	10,0	13,0	15,5	10,0	13,0	17,5	10,0	13,0	14,0	13,5	19,0						
4				14,5	12,0	15,0	16,0	12,0	15,0	18,5	12,0	15,0	19,5	12,0	15,0	16,0	15,5	21,0	18,0	17,5	23,0			
5,5				17,5	15,0	18,0	18,0	15,0	18,0	20,2	15,0	18,0	22,5	15,0	18,0	19,0	18,5	24,0	21,0	20,5	26,0	24,0	23,5	29,0
7,5				21,5	19,0	22,0	23,0	19,0	22,0	24,5	19,0	22,0	26,5	19,0	22,0	23,0	22,5	28,0	25,0	24,5	30,0	28,0	27,5	33,0
11				27,5	25,0	28,0	29,0	25,0	28,0	30,5	25,0	28,0	32,5	25,0	28,0	29,0	28,5	34,0	31,0	30,5	36,0	34,0	33,5	39,0
2x4																24,0	23,5	29,0	26,0	25,5	31,0	29,0	28,5	34,0
2x5,5																30,0	29,5	35,0	32,0	31,5	37,0	35,0	34,5	40,0
2x7,5																38,0	37,5	43,0	40,0	39,5	45,0	43,0	42,5	48,0
2x11																50,0	49,5	55,0	52,0	51,5	57,0	55,0	54,5	60,0
3x4																								
3x5,5																								
3x7,5																								
3x11																								
4x4																								
4x5,5																								
4x7,5																								
4x11																								
0,25																								
0,5																								

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Table B

Motor power [kW]	7,5			11			2x4			2x5,5			2x7,5			2x11			3x4			3x5,5
	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1
0,55																						
0,75																						
1,1																						
1,5																						
2,2																						
3																						
4																						
5,5																						
7,5	32,0	31,5	37,0																			
11	38,0	37,5	43,0	44,0	43,5	49,0																
2x4	33,0	32,5	38,0	39,0	38,5	44,0	34,0	33,5	39,0													
2x5,5	39,0	38,5	44,0	45,0	44,5	50,0	40,0	39,5	45,0	46,0	45,5	51,0										
2x7,5	47,0	46,5	52,0	53,0	52,5	58,0	48,0	47,5	53,0	54,0	53,5	59,0	62,0	61,5	67,0							
2x11	59,0	58,5	64,0	65,0	64,5	70,0	60,0	59,5	65,0	66,0	65,5	71,0	74,0	73,5	79,0	86,0	85,5	91,0				
3x4							42,0	41,5	47,0	48,0	47,5	53,0	56,0	55,5	61,0	68,0	67,5	73,0	50,0	49,5	55,0	
3x5,5							51,0	50,5	56,0	57,0	56,5	62,0	65,0	64,5	70,0	77,0	76,5	82,0	59,0	58,5	64,0	68,0
3x7,5							63,0	62,5	68,0	69,0	68,5	74,0	77,0	76,5	82,0	89,0	88,5	94,0	71,0	70,5	76,0	80,0
3x11							81,0	80,5	86,0	87,0	86,5	92,0	95,0	94,5	100,0	107,0	106,5	112,0	89,0	88,5	94,0	98,0
4x4																			58,0	57,5	63,0	67,0
4x5,5																			70,0	69,5	75,0	79,0
4x7,5																			86,0	85,5	91,0	95,0
4x11																			110,0	109,5	115,0	119,0
0,25																						
0,5																						

Motor power [kW]	3x5,5		3x7,5			3x11			4x4			4x5,5			4x7,5			4x11			0,25	0,5
	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3	L	L
0,55																						
0,75																						
1,1																						
1,5																						
2,2																						
3																						
4																						
5,5																						
7,5																						
11																						
2x4																						
2x5,5																						
2x7,5																						
2x11																						
3x4																						
3x5,5	67,5	73,0																				
3x7,5	79,5	85,0	92,0	91,5	97,0																	
3x11	97,5	103,0	110,0	109,5	115,0	128,0	127,5	133,0														
4x4	66,5	72,0	79,0	78,5	84,0	97,0	96,5	102,0	66,0	65,5	71,0											
4x5,5	78,5	84,0	91,0	90,5	96,0	109,0	108,5	114,0	78,0	77,5	83,0	90,0	89,5	95,0								
4x7,5	94,5	100,0	107,0	106,5	112,0	125,0	124,5	130,0	94,0	93,5	99,0	106,0	105,5	111,0	122,0	121,5	127,0					
4x11	118,5	124,0	131,0	130,5	136,0	149,0	148,5	154,0	118,0	117,5	123,0	130,0	129,5	135,0	146,0	145,5	151,0	170,0	169,5	175,0		
0,25																					12	
0,5																					14	16

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Table C

Motor power [kW]	0,55	0,75	1,1	1,5	2,2	3	4	5,5	7,5	11	2x4	2x5,5	2x7,5	2x11	3x4	3x5,5	3x7,5	3x11	4x4	4x5,5	4x7,5	4x11	0,25	0,5
0,55	1,5																							
0,75	1,5	1,5																						
1,1		1,5	1,5																					
1,5		1,5	1,5	1,5																				
2,2		1,5	1,5	1,5	1,5																			
3		1,5	1,5	2,5	2,5	2,5																		
4		1,5	2,5	2,5	2,5	2,5	2,5																	
5,5		2,5	2,5	2,5	2,5	2,5	4	4																
7,5		2,5	2,5	4	4	4	4	4	6															
11		4	4	4	6	6	6	6	10	10														
2x4						4	4	6	6	10	6													
2x5,5						6	6	6	10	10	10	10												
2x7,5						10	10	10	10	10	10	10	16											
2x11						10	10	16	16	16	16	16	16	25										
3x4											10	10	16	16	10									
3x5,5											10	16	16	25	16	16								
3x7,5											16	16	25	25	16	25	25							
3x11											25	25	25	16 (2x)	25	16 (2x)	16 (2x)	25 (2x)						
4x4											16				16	16	25	16 (2x)	16					
4x5,5											16				16	25	25	16 (2x)	25	25				
4x7,5											25				25	25	16 (2x)	25 (2x)	25	16 (2x)	25 (2x)			
4x11											25 (1x) 10 (1x)				25 (1x) 10 (1x)	25 (1x) 10 (1x)	25 (2x)	35 (2x)	25 (1x) 10 (1x)	25 (2x)	25 (2x)	35 (2x)		
0,25																							1,5	
0,5																							1,5	2,5

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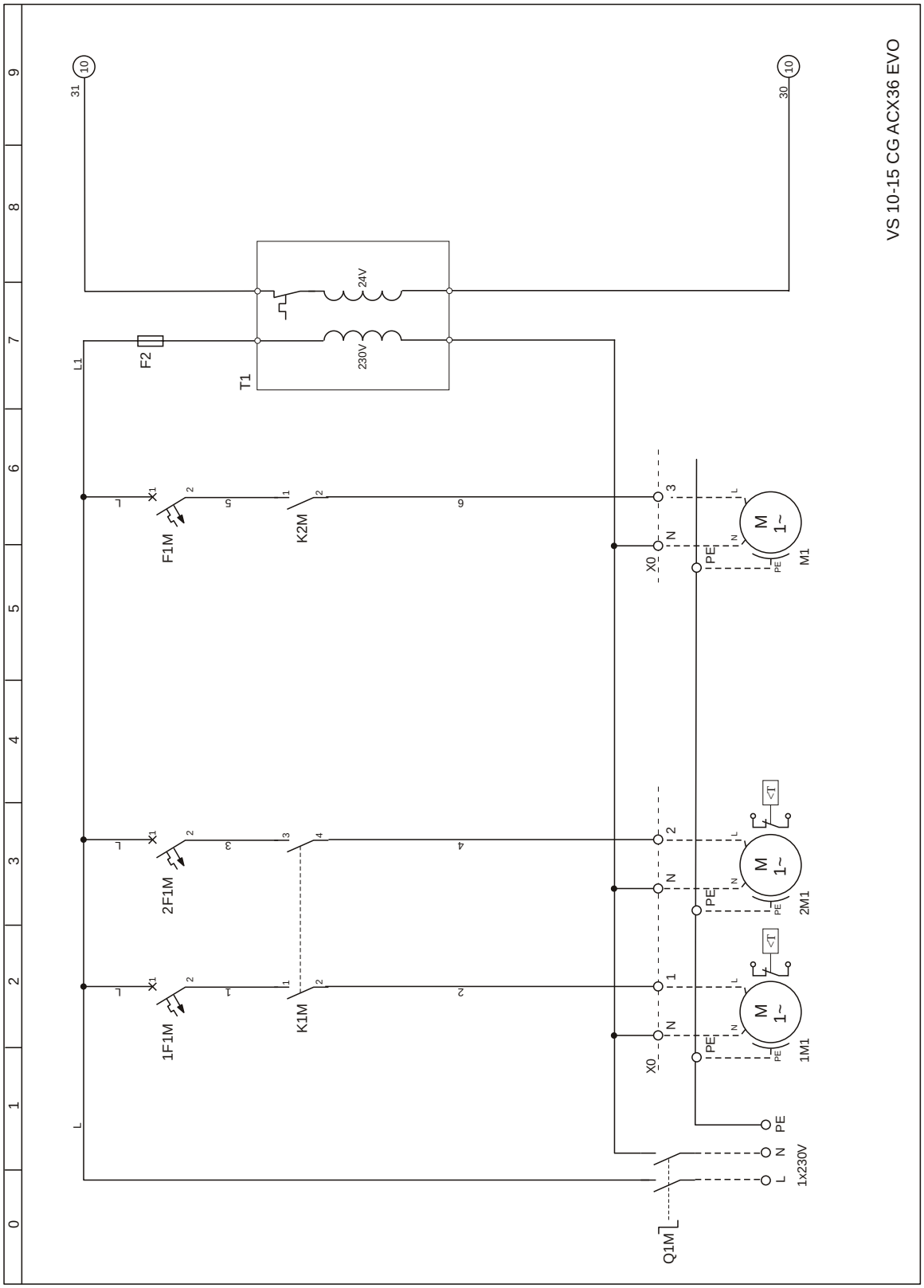
Appendix 1 Circuit diagram of VS 10-15 CG ACX36 EVO control gear 1/2



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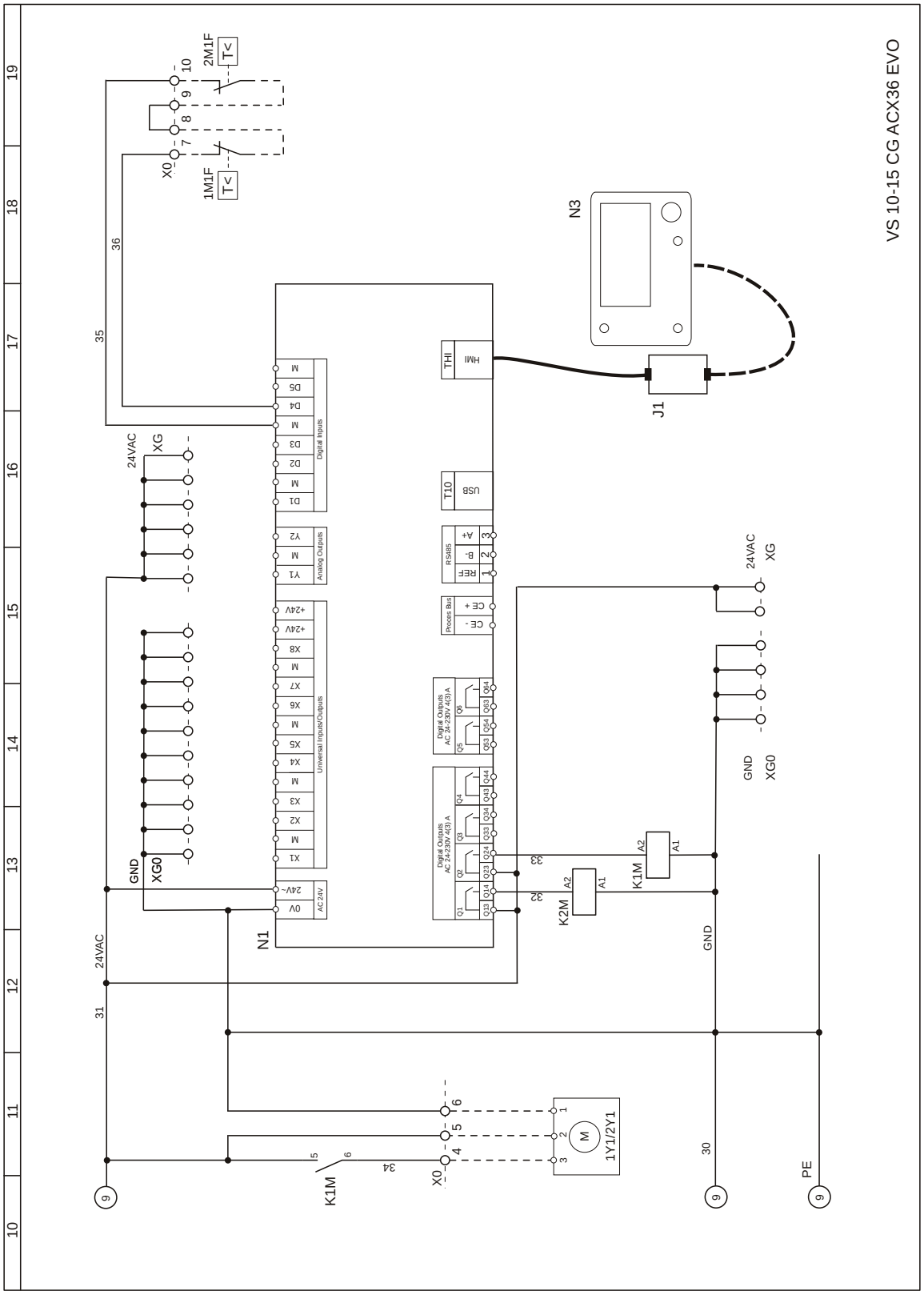
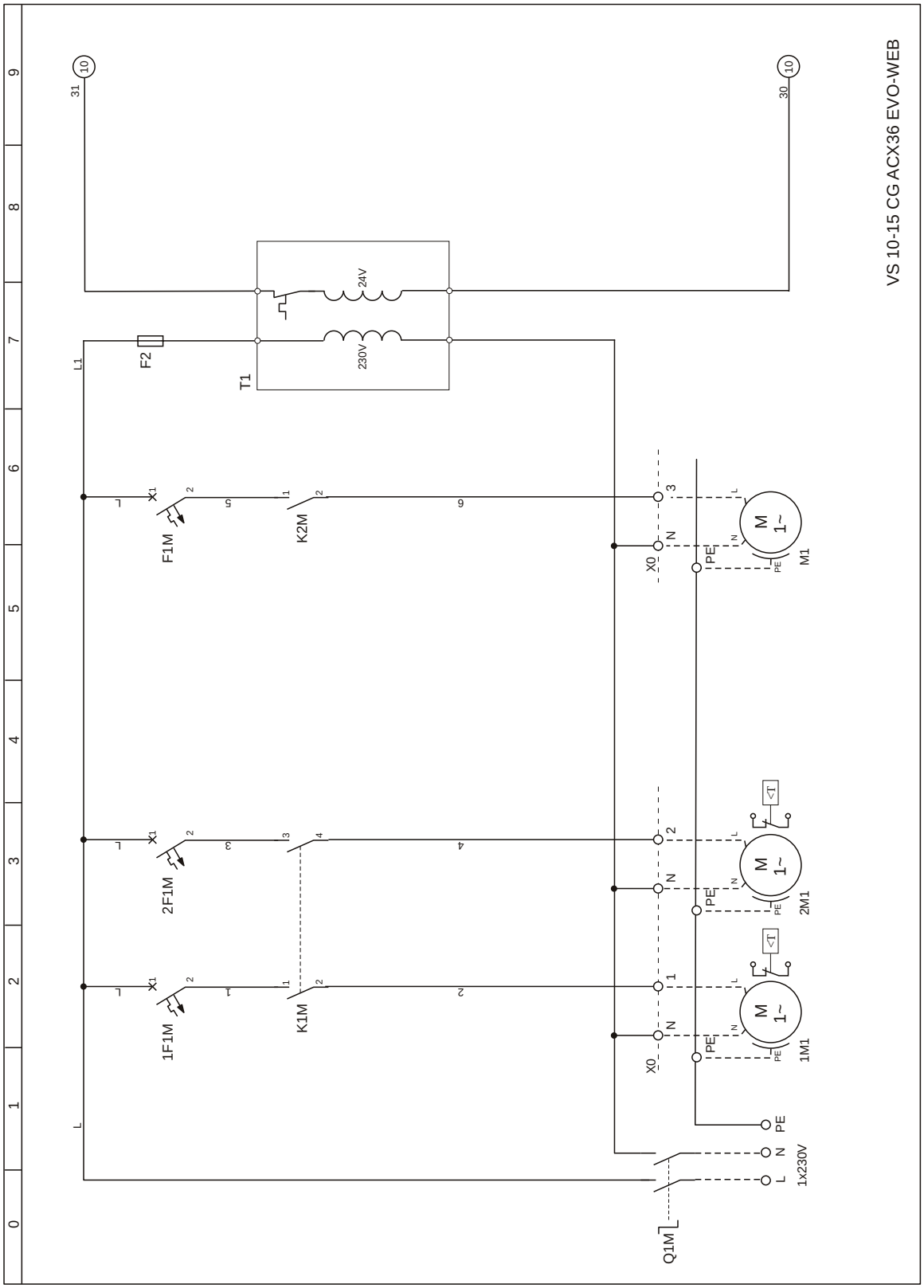
Appendix 1 Circuit diagram of VS 10-15 CG ACX36 EVO control gear 2/2



Appendix 2 Circuit diagram of VS 10-15 CG ACX36 EVO-WEB control gear 1/2



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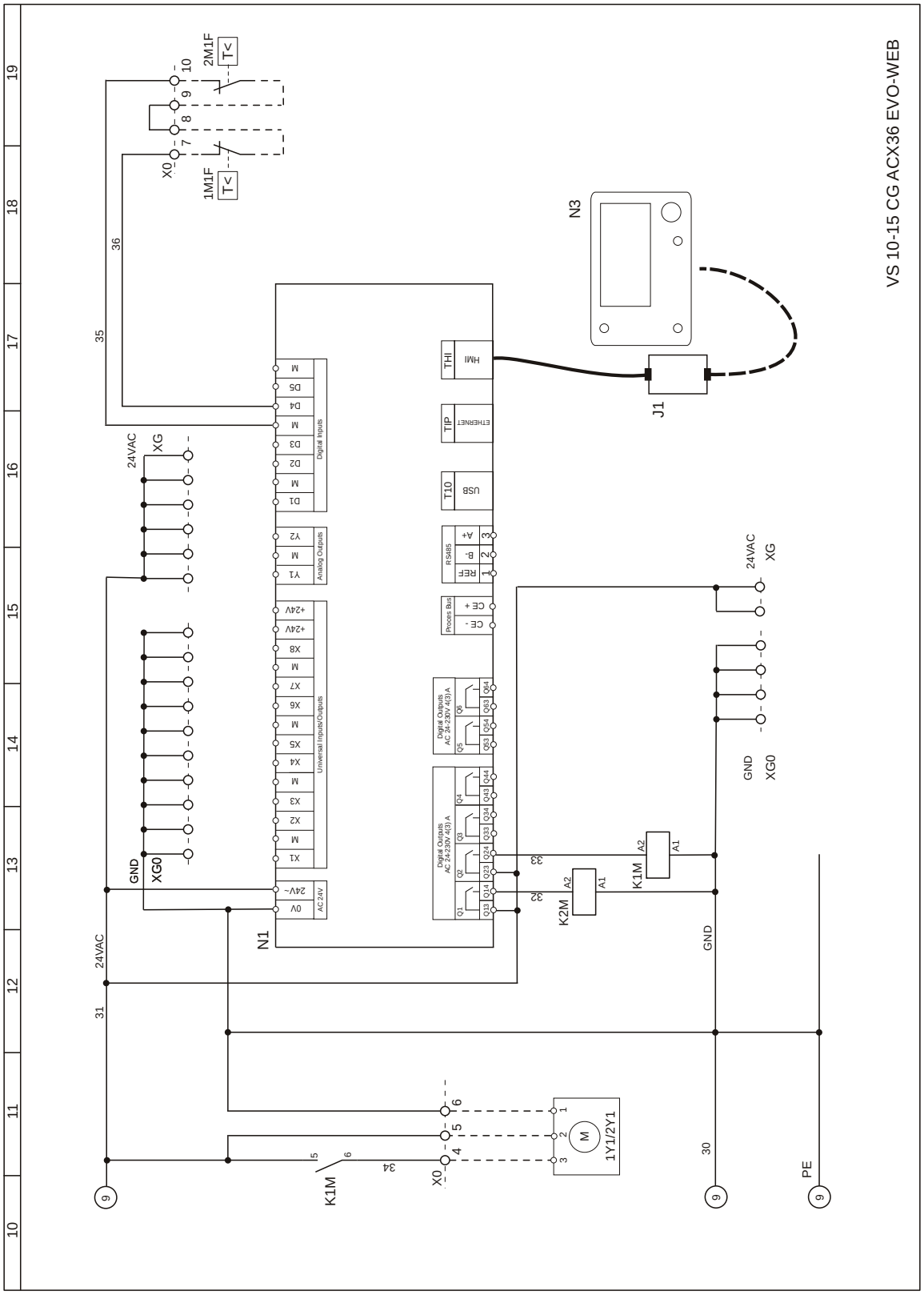
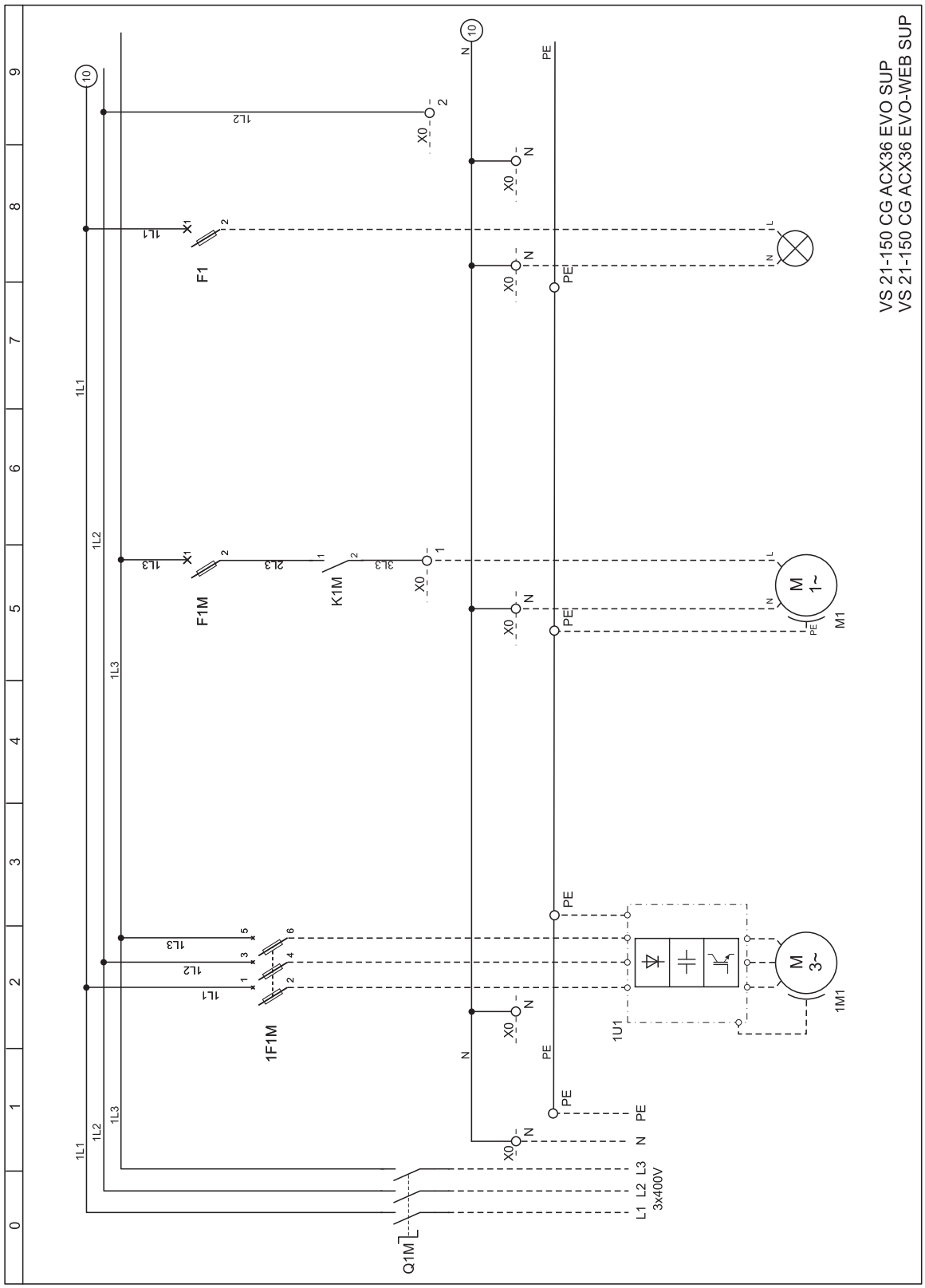
Appendix 2 Circuit diagram of VS 10-15 CG ACX36 EVO-WEB control gear 2/2



Appendix 3 Circuit diagram of VS 21-150 CG ACX36 EVO (EVO-WEB) SUP control gear 1/2



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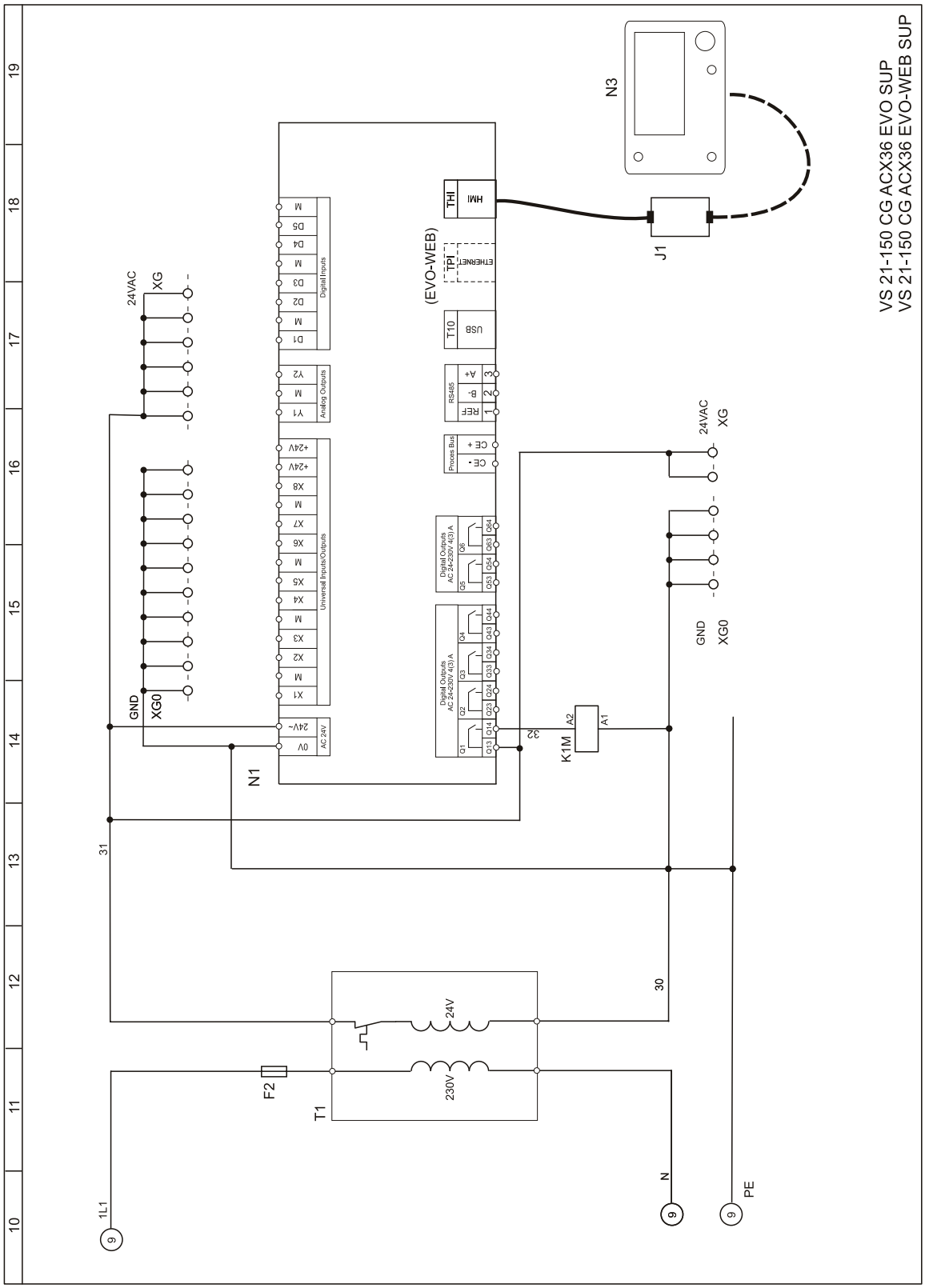
Appendix 3 Circuit diagram of VS 21-150 CG ACX36 EVO (EVO-WEB) SUP control gear 2/2



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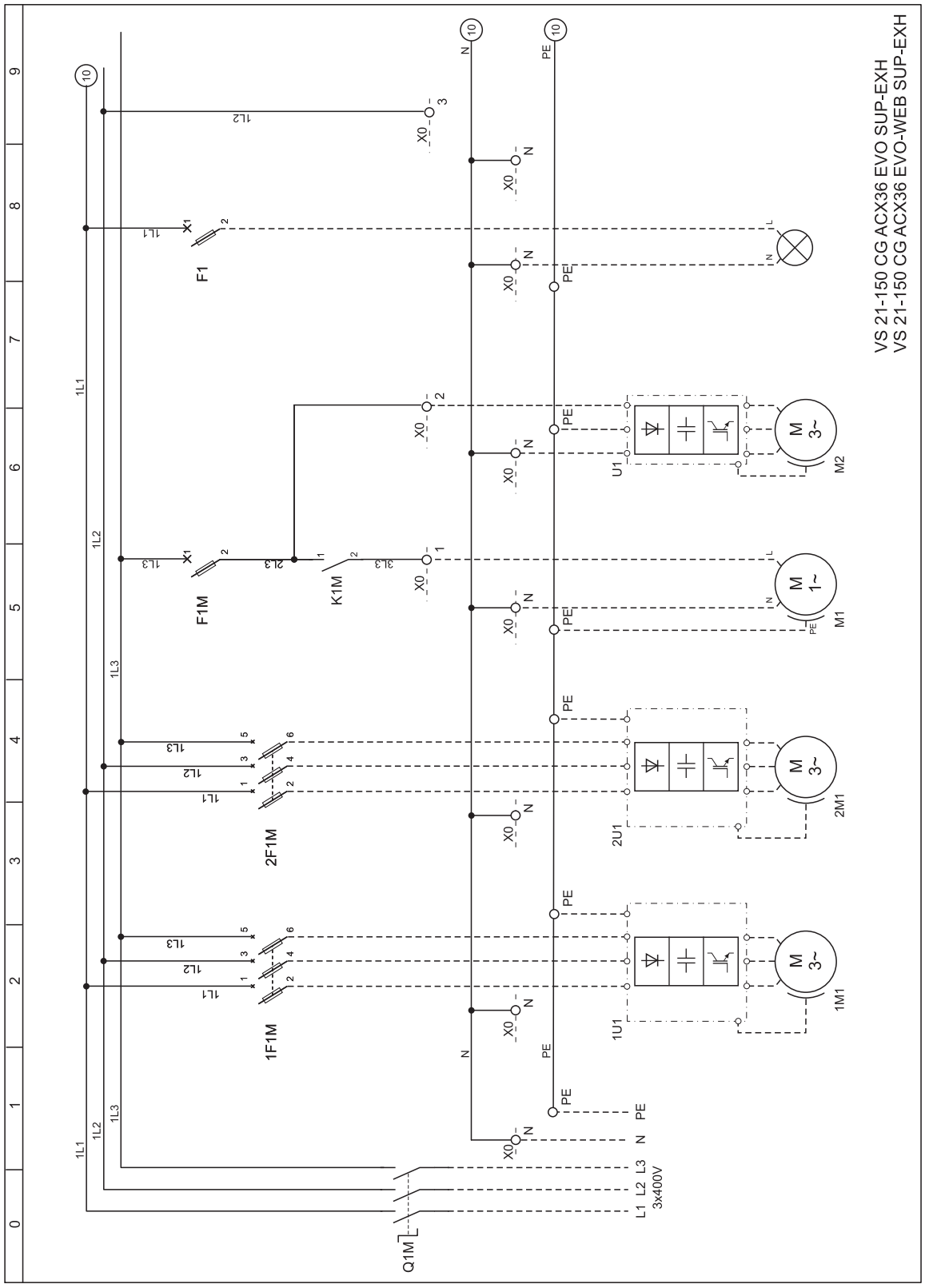
Appendix 4 Circuit diagram of VS 21-150 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear 1/2



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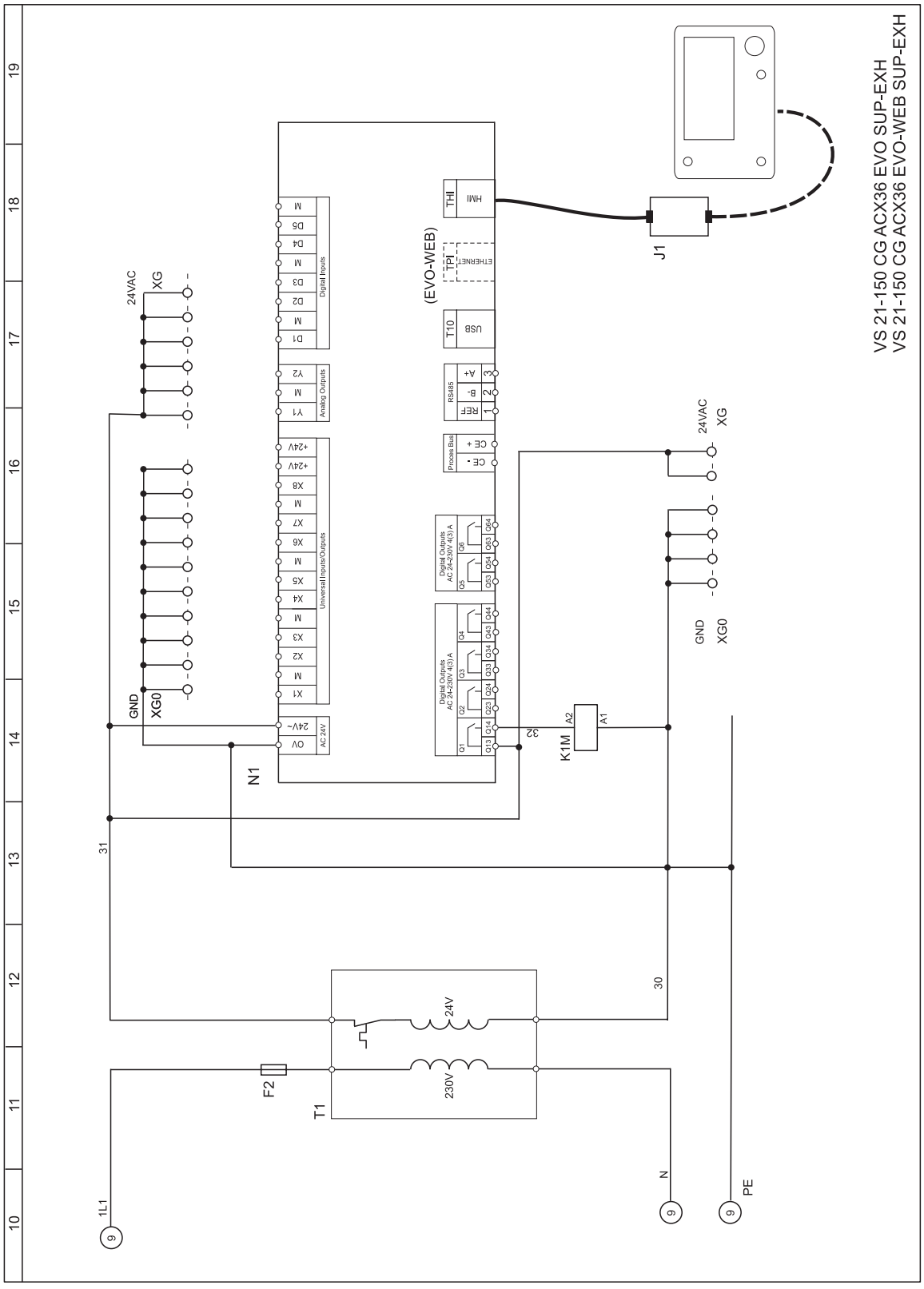
Appendix 4 Circuit diagram of VS 21-150 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear 2/2



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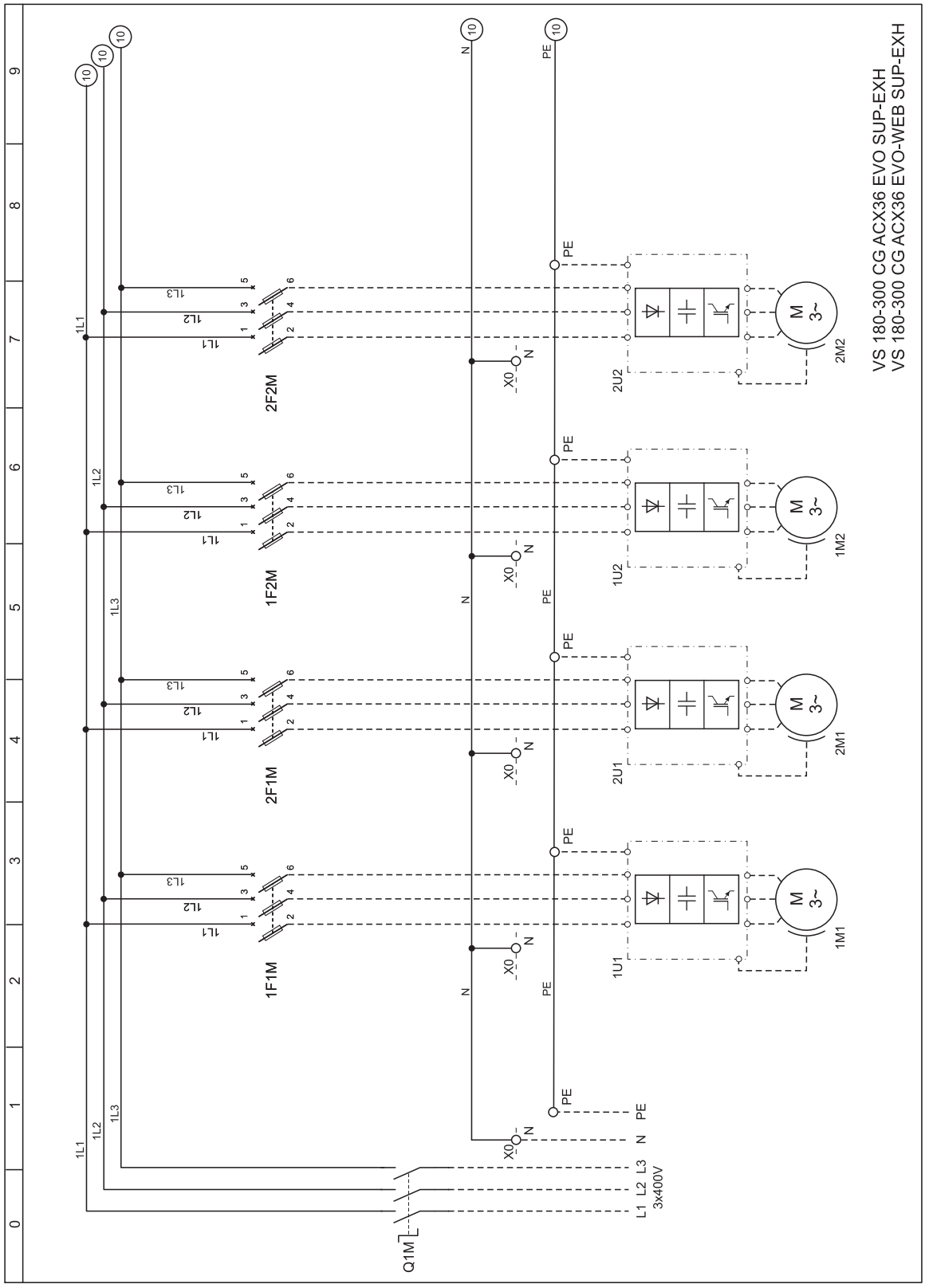
Appendix 5 Circuit diagram of VS 180-300 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear 1/3



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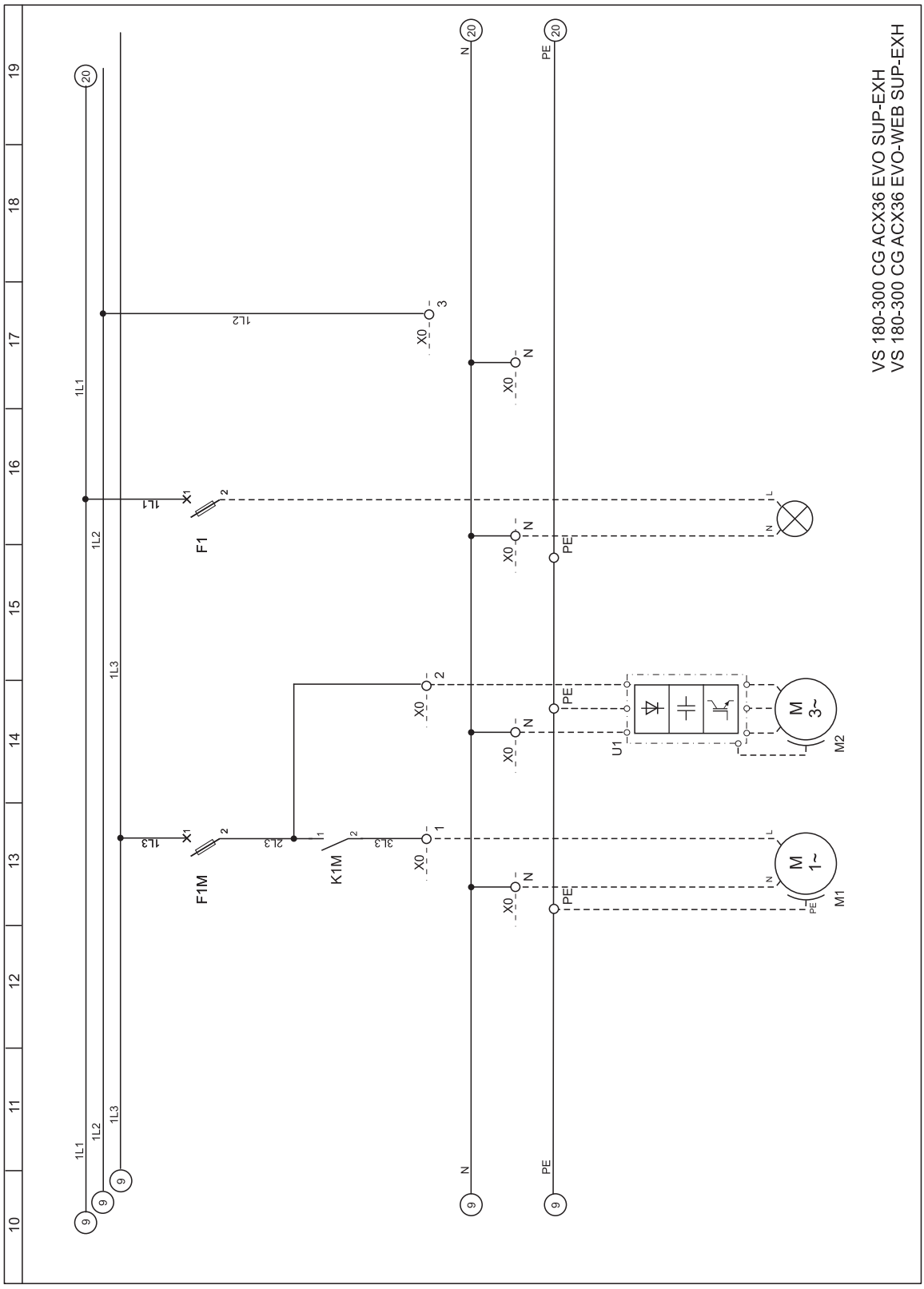
Appendix 5 Circuit diagram of VS 180-300 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear 2/3



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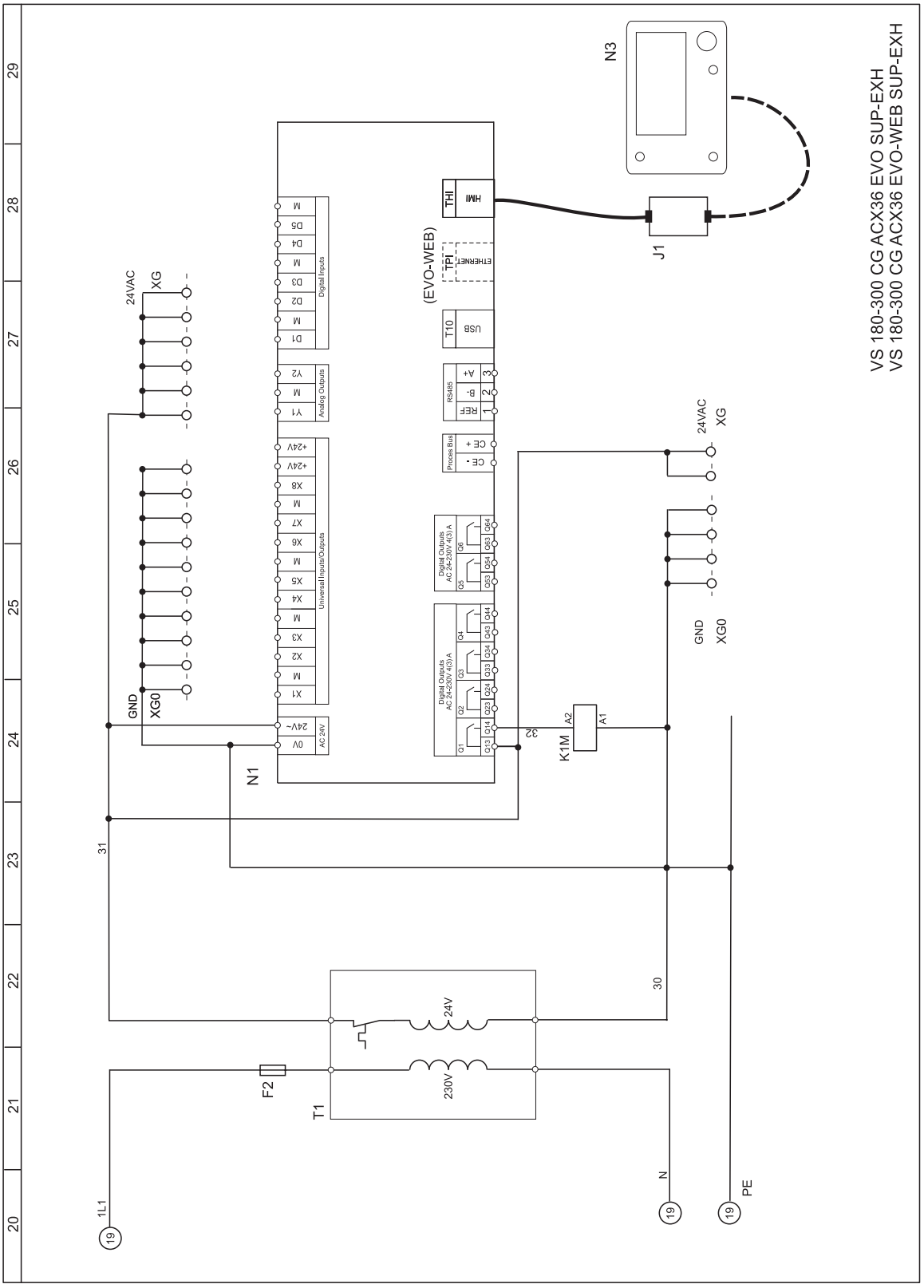
Appendix 5 Circuit diagram of VS 180-300 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear 3/3



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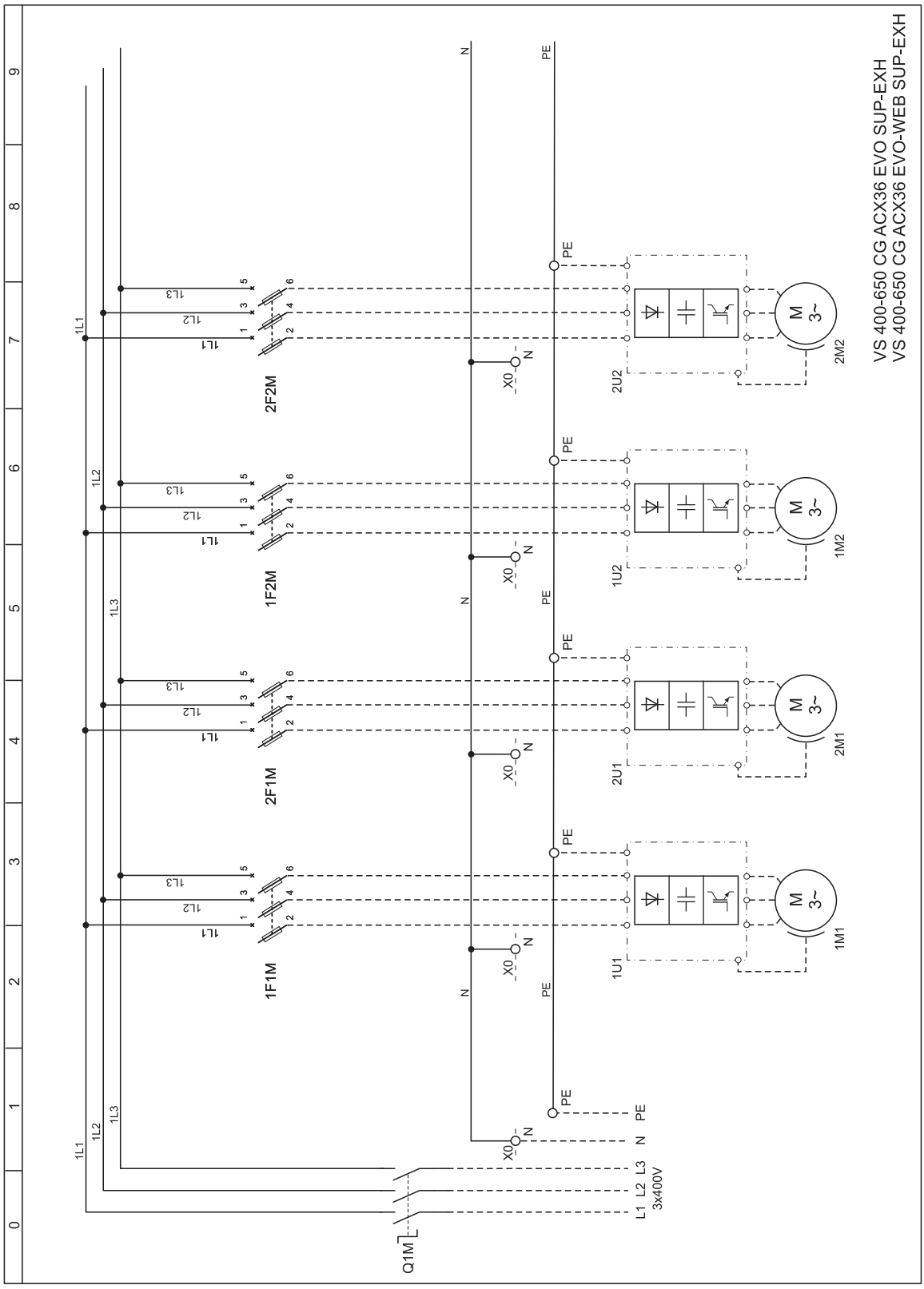
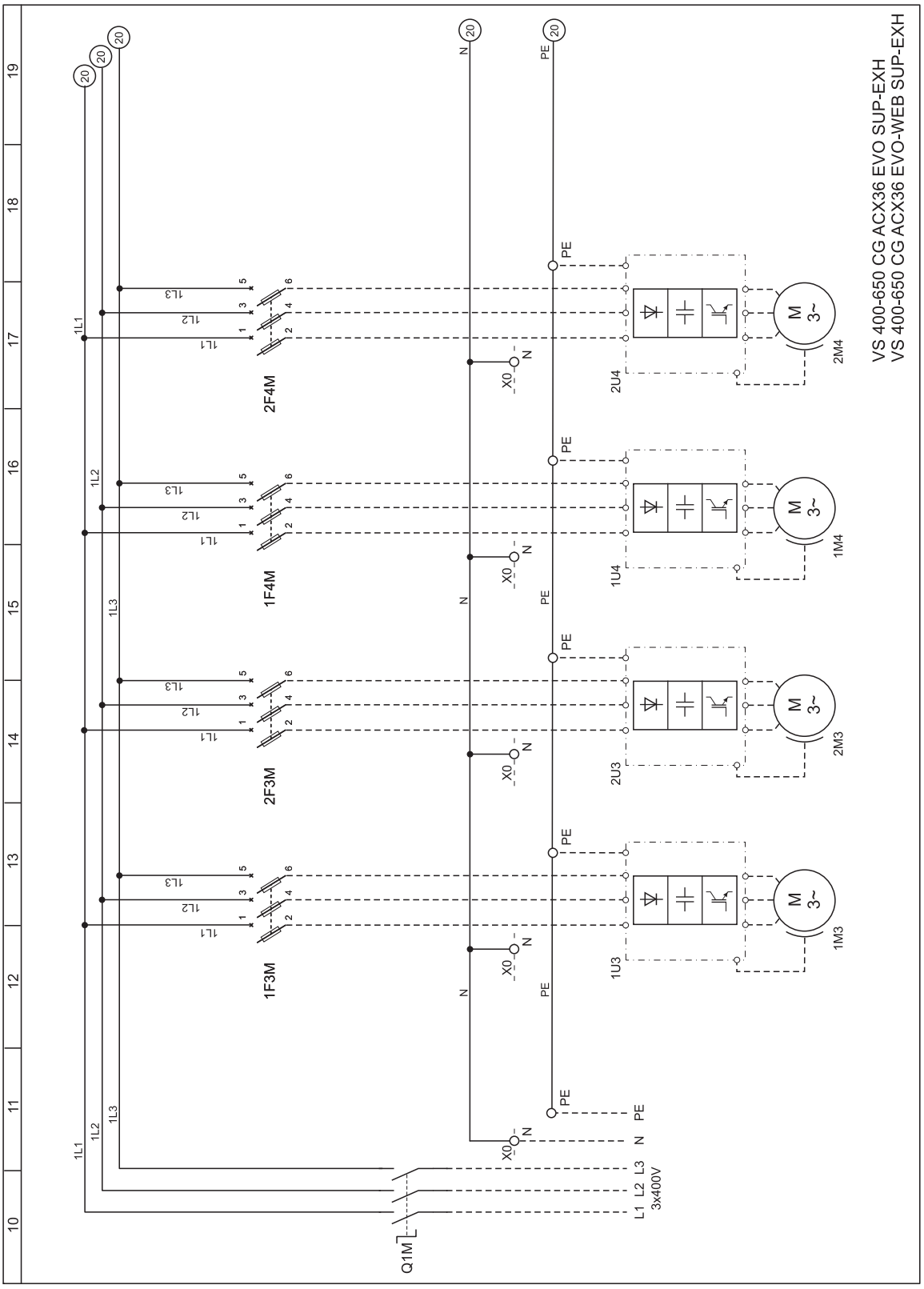
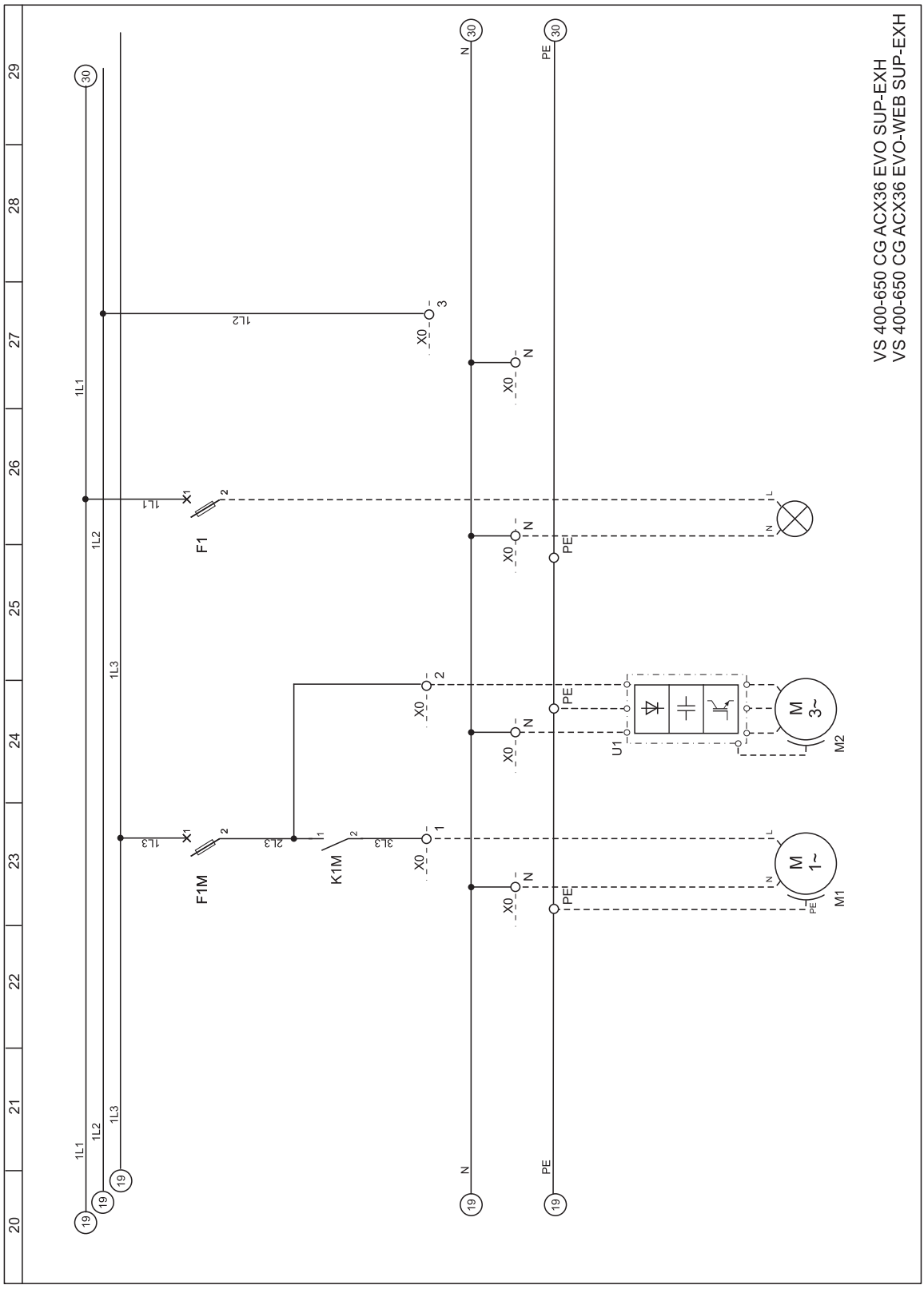
Appendix 6 Circuit diagram of VS 400-650 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear 1/4



Appendix 6 Circuit diagram of VS 400-650 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear 2/4



Appendix 6 Circuit diagram of VS 400-650 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear 3/4



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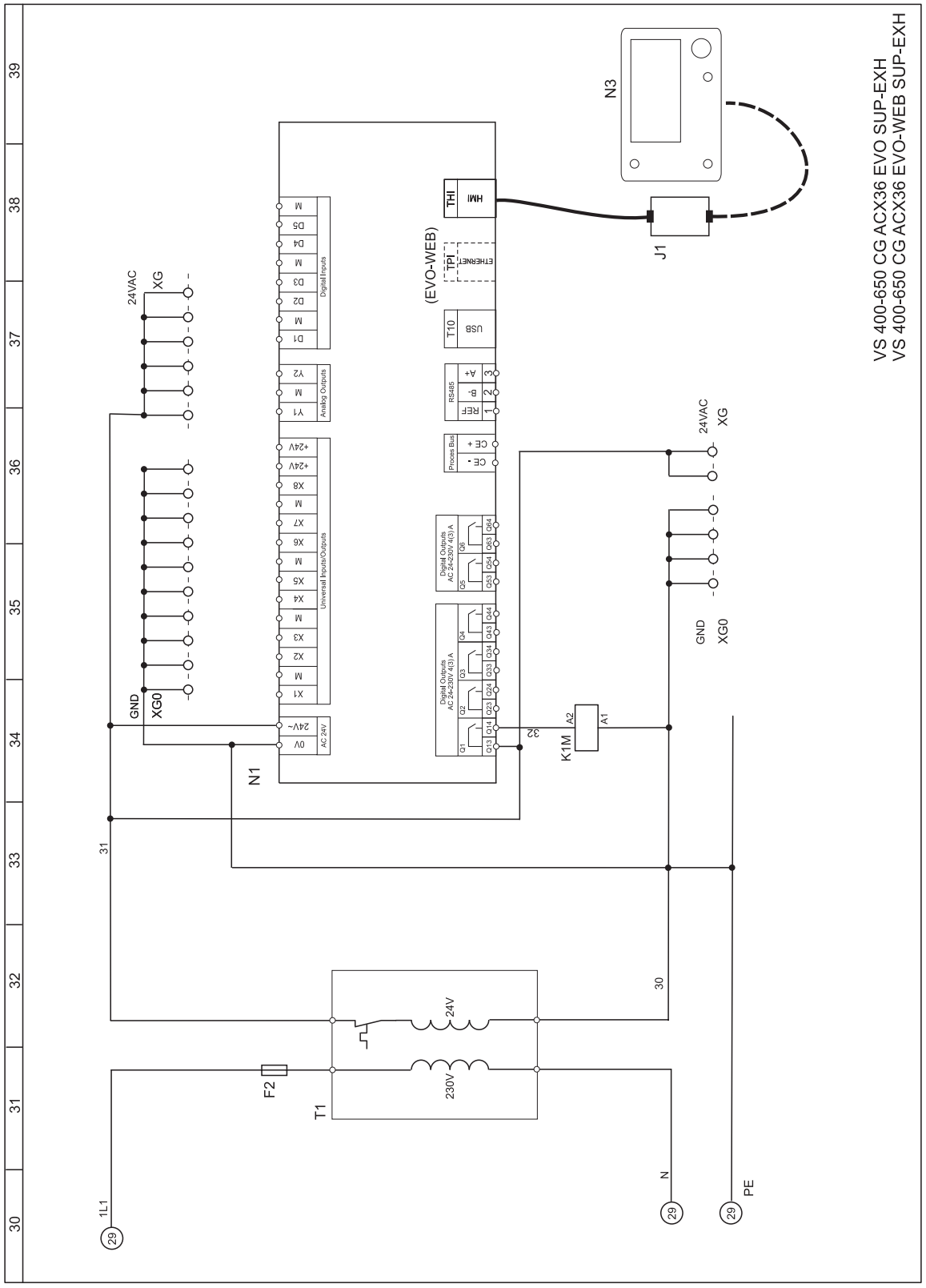
Appendix 6 Circuit diagram of VS 400-650 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear 4/4



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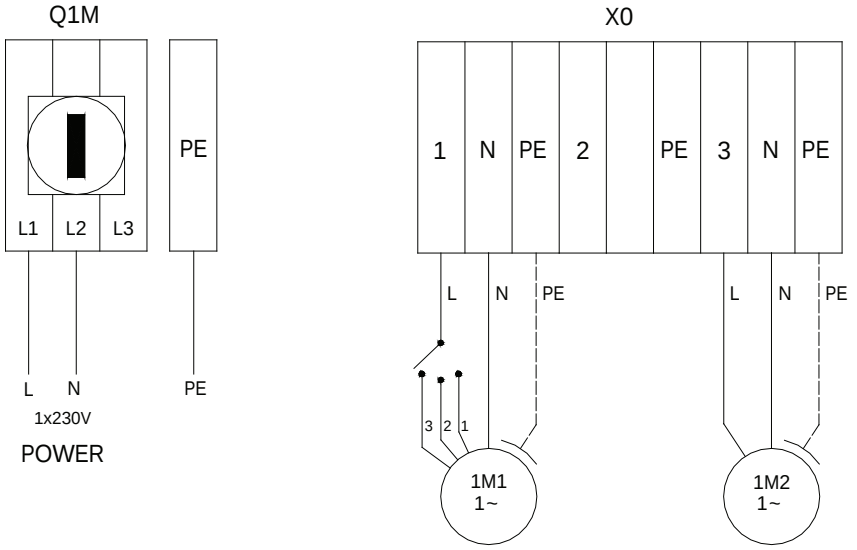
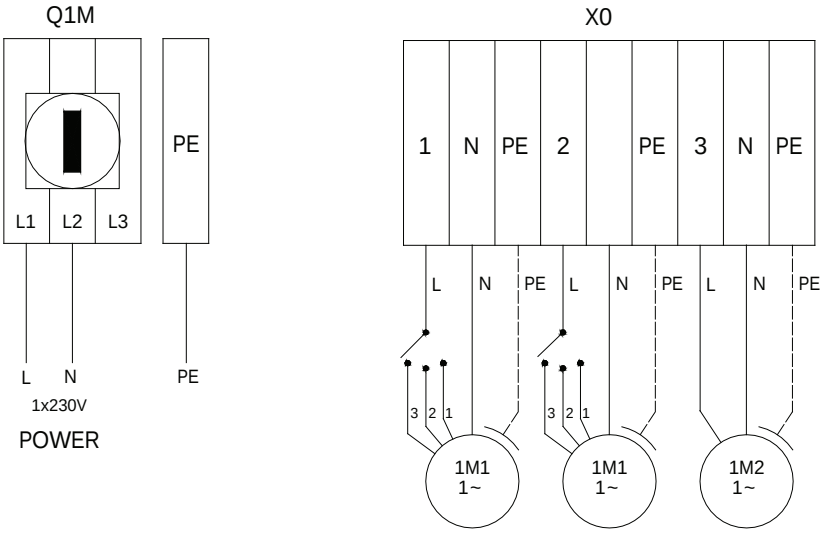
Appendix 7 Circuit diagram of power and motor connection VS 10-15 CG ACX36 EVO (EVO-WEB) control gears (VS 10 unit)

VS 10 sup unit



VS 10 sup-exh unit



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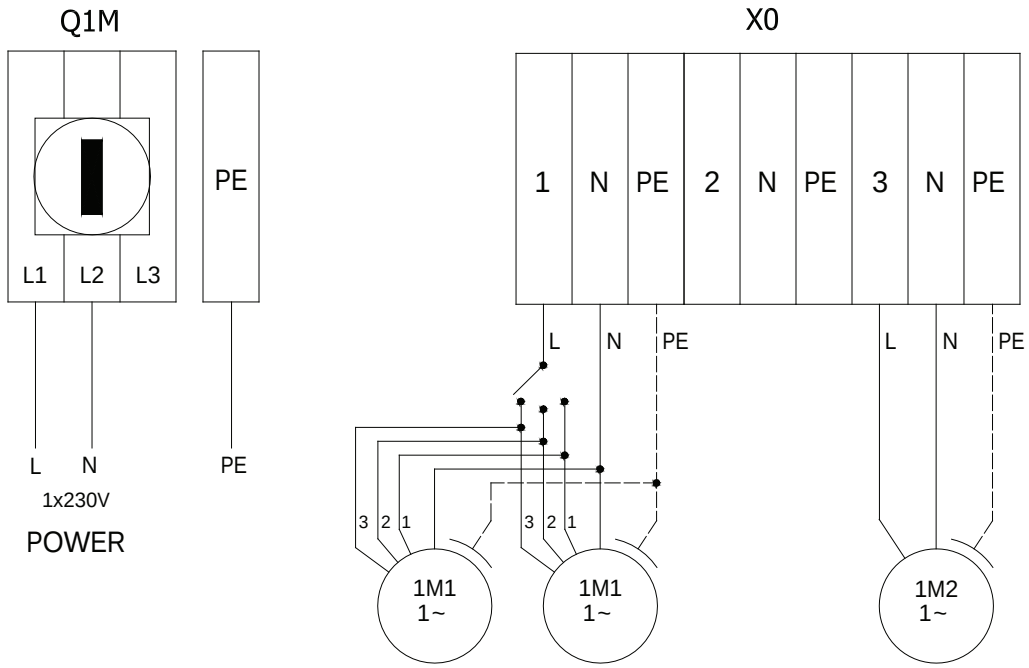
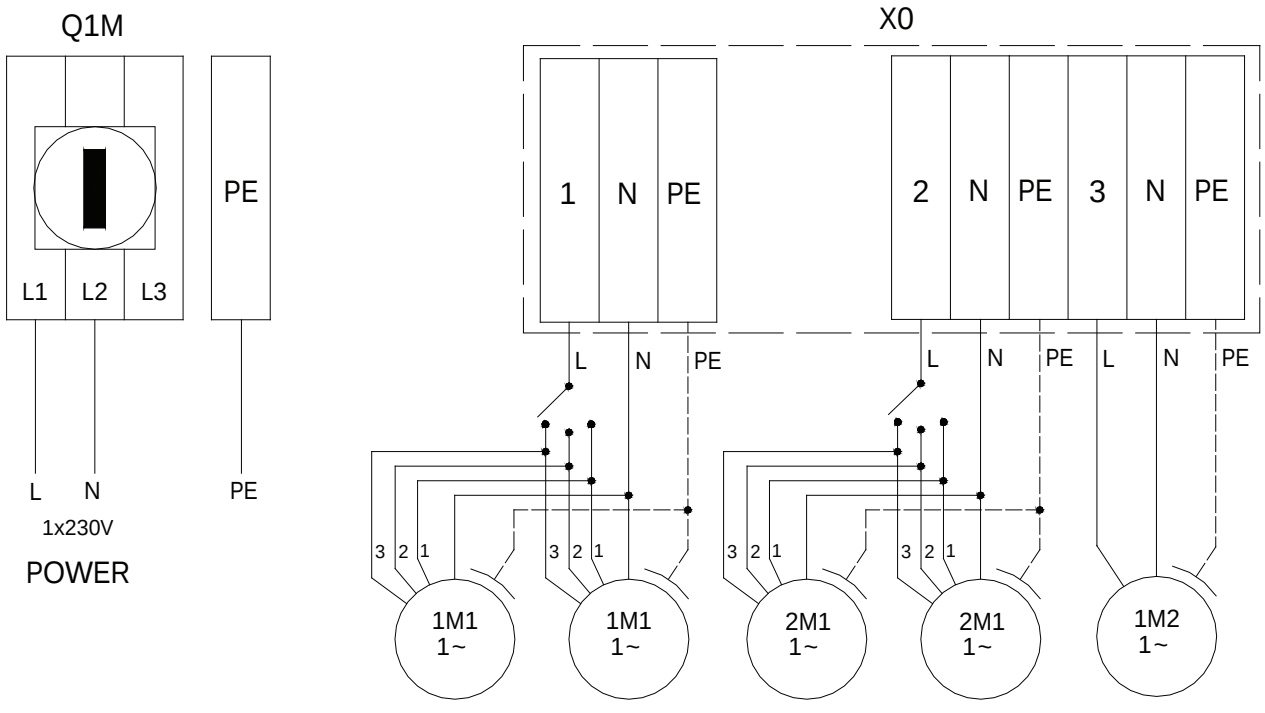
Appendix 8 Circuit diagram of power and motor connection VS 10-15 CG ACX36 EVO (EVO-WEB) control gears (VS 15 unit)

VS 15 sup unit



VS 15 sup-exh unit



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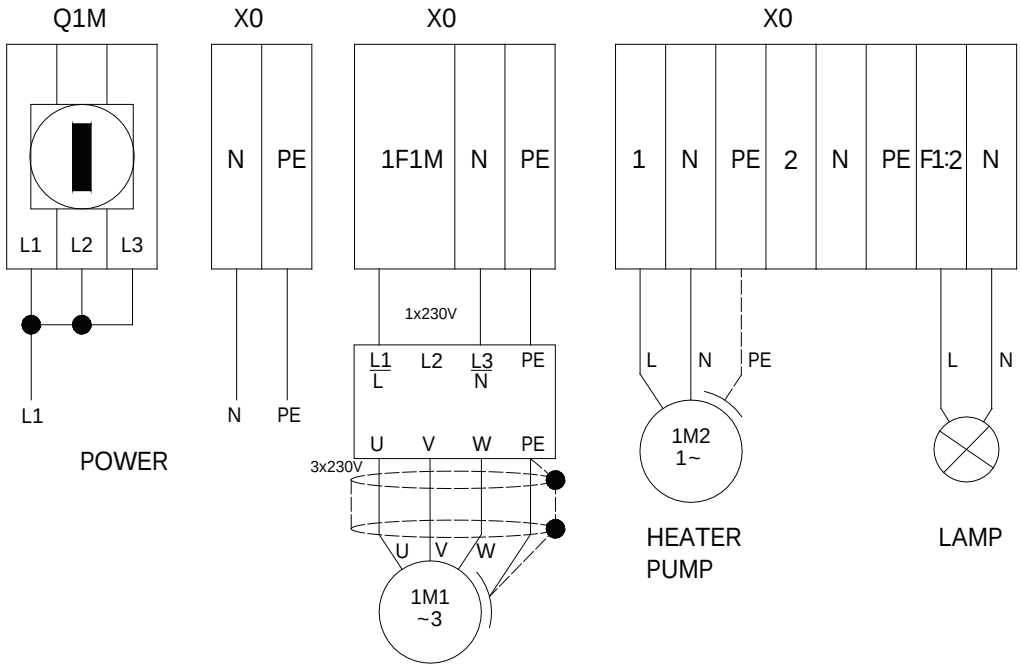
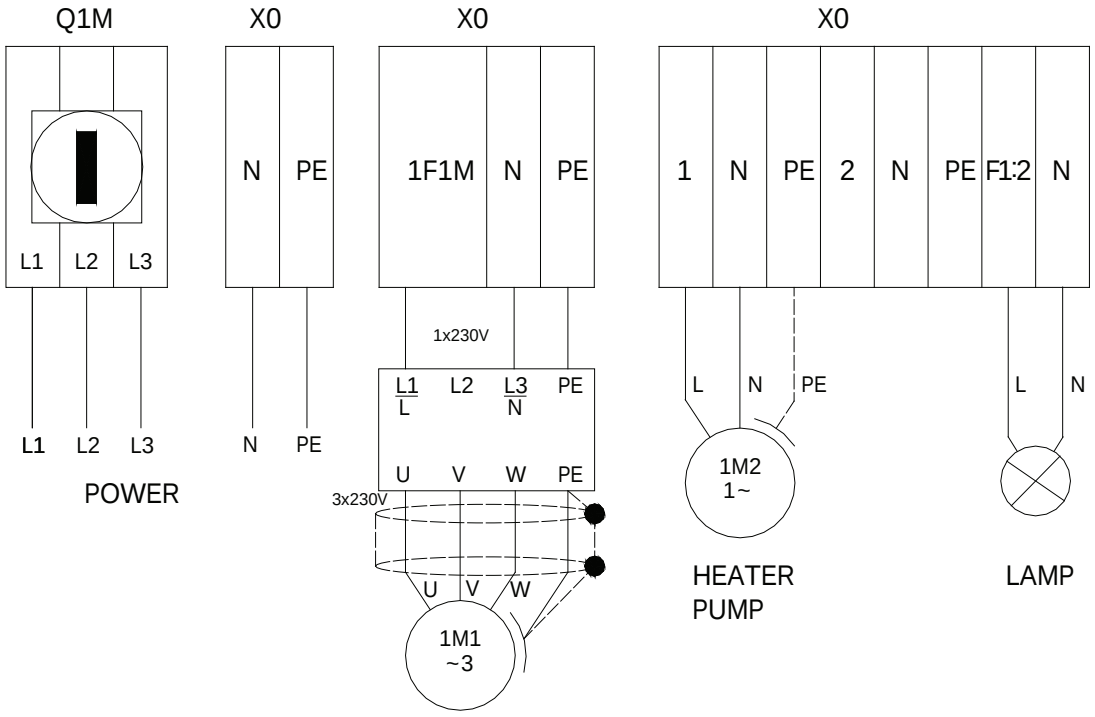
Appendix 9 Circuit diagram of power and motor connection for VS 21-150 CG ACX36 EVO (EVO-WEB) SUP control gear (VS 10-15 sup unit)

1x230V power supply, frequency converter with 1x230V suply



3x400V power supply, frequency converter with 1x230V suply



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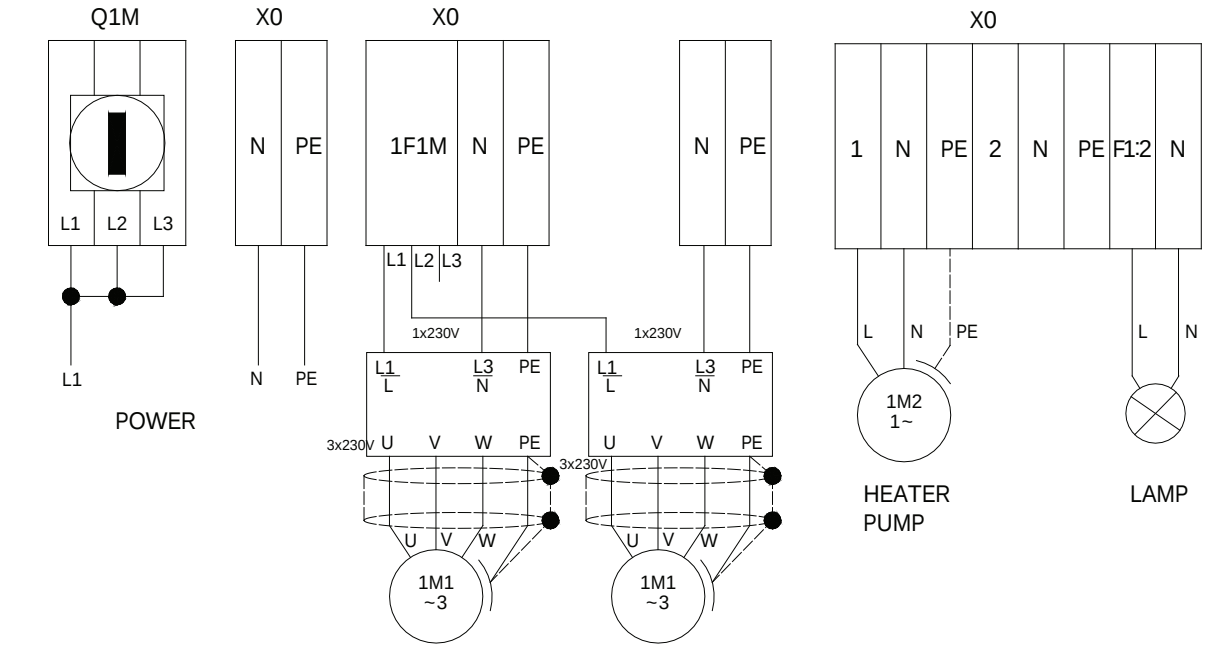
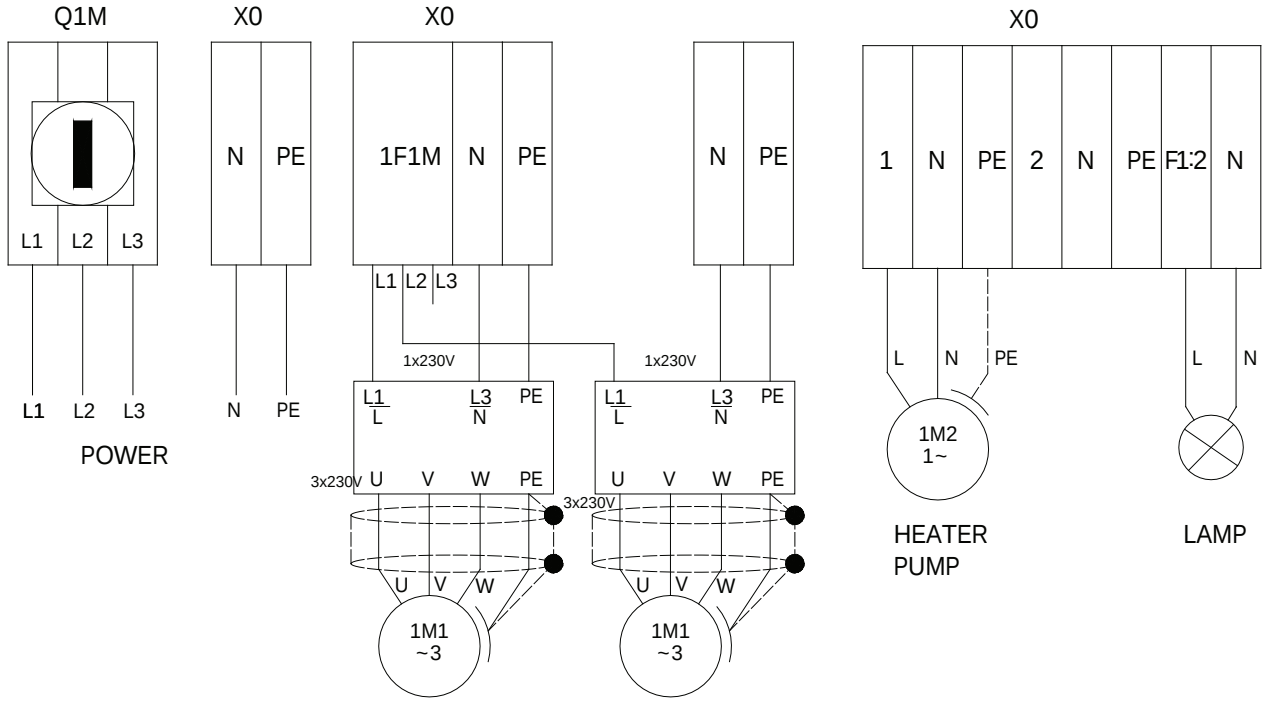
Appendix 10 Circuit diagram of power and motor connection for VS 21-150 CG ACX36 EVO (EVO-WEB) SUP control gear (VS 10-15 sup-exh unit)

1x230V power supply, frequency converter with 1x230V suply



3x400V power supply, frequency converter with 1x230V suply



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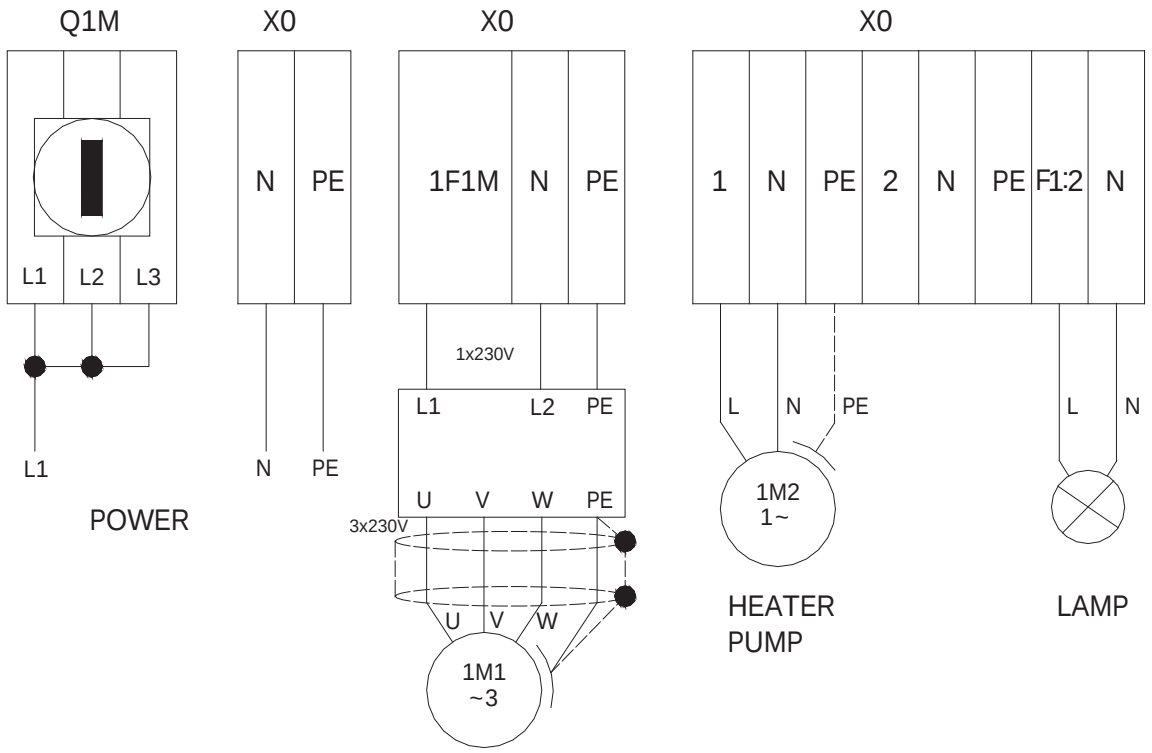
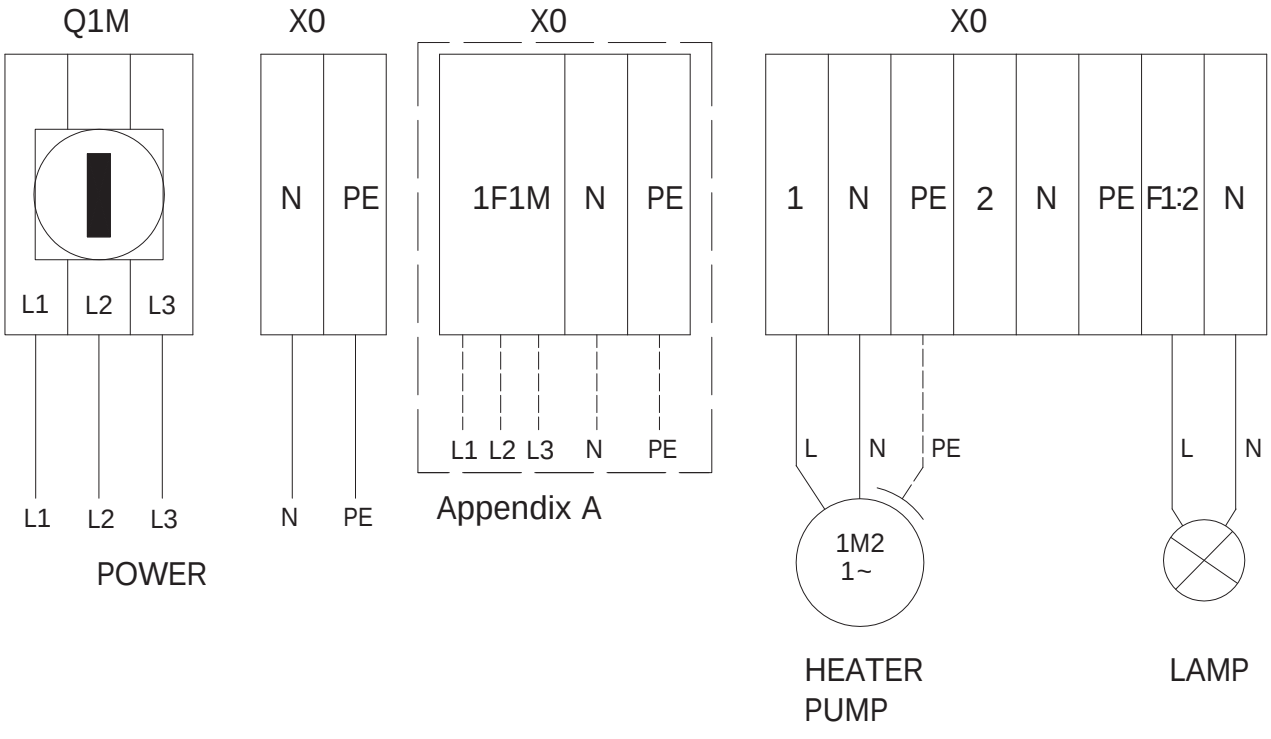
Appendix 11 Circuit diagram of power and motor connection for VS 21-150 CG ACX36 EVO (EVO-WEB) SUP control gear

1x230V power supply, frequency converter with 1×230V supply



3x400V power supply, frequency converter with 1×230V or 3x400V supply



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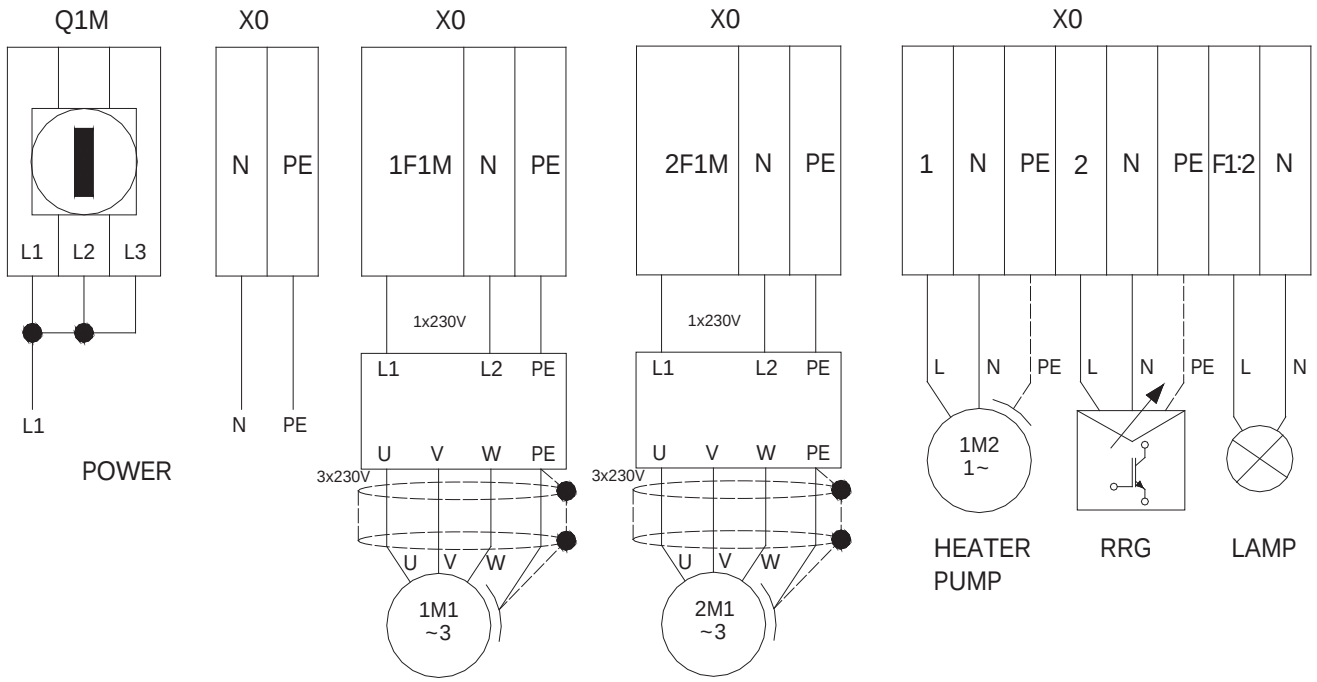
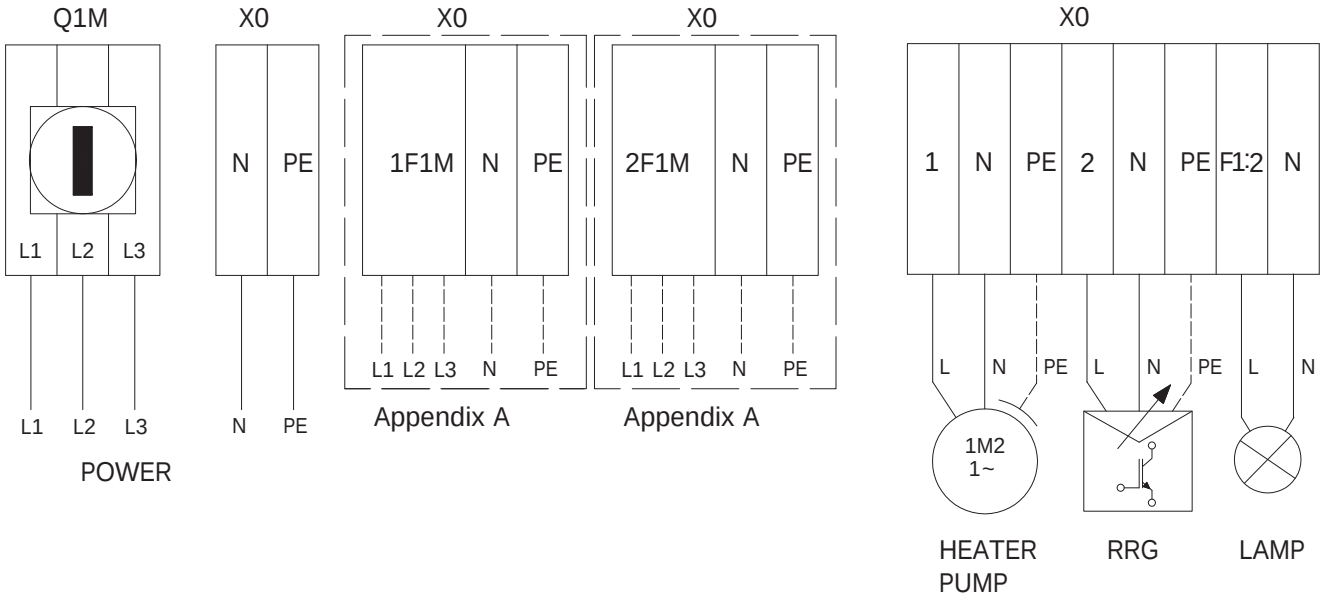
Appendix 12 Circuit diagram of power and motor connection VS 21-150 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear (used also for VS 180-300 supply)

1x230V power supply, frequency converter with 1×230V supply



3x400V power supply, frequency converter with 1×230V or 3x400V supply



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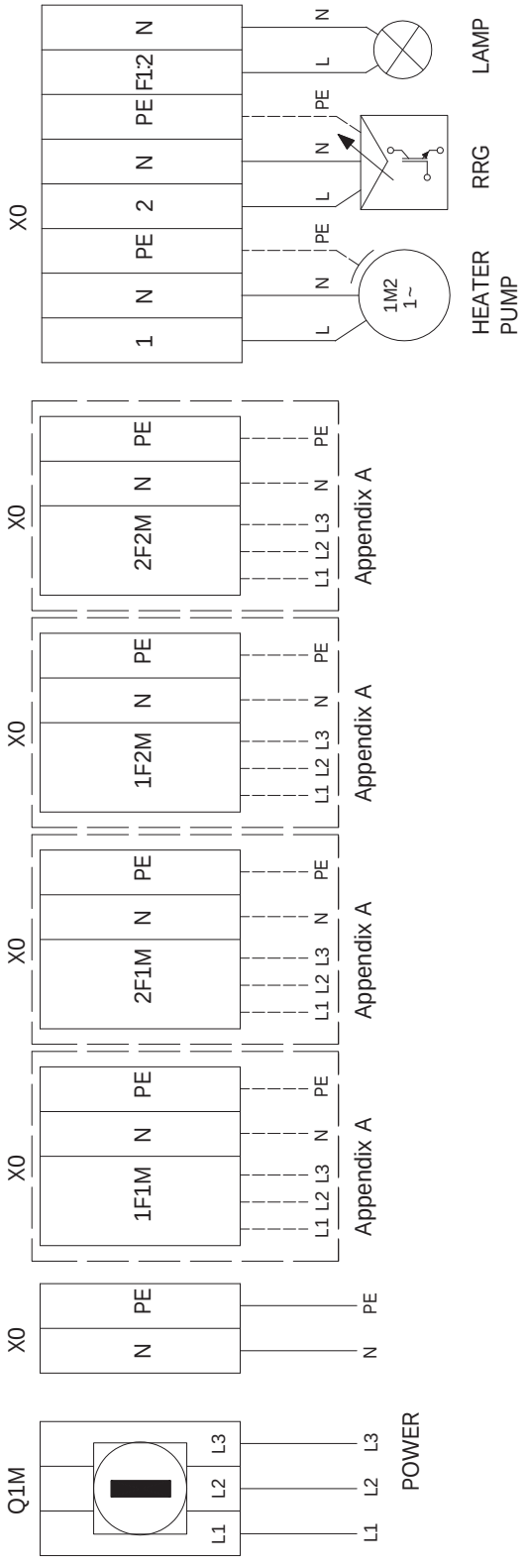
Appendix 13 Circuit diagram of power and motor connection for VS 180-300 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear (used also for VS 400-650 supply)

3x400V power supply, frequency converter with 1×230V or 3x400V supply



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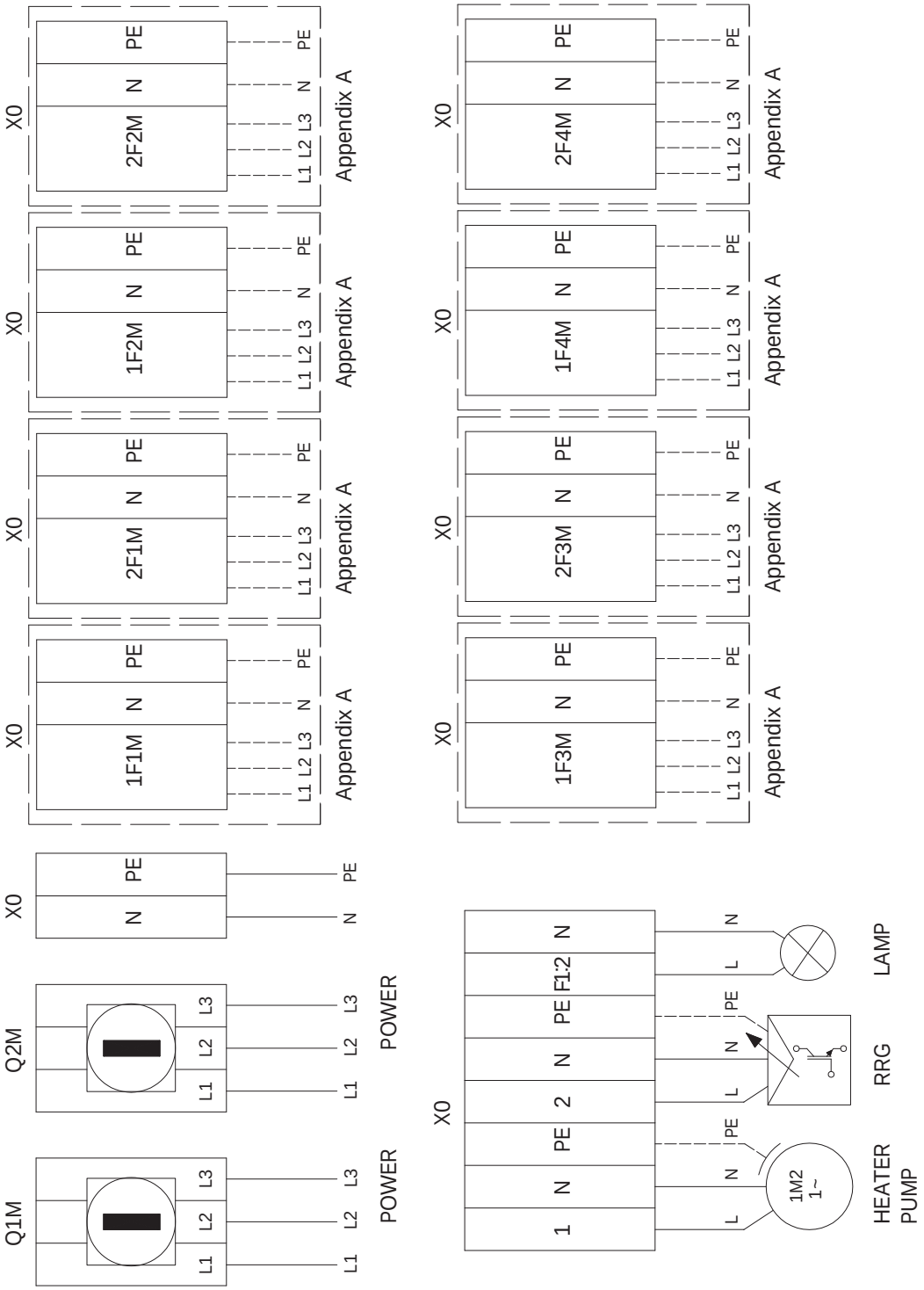
Appendix 14 Circuit diagram of power and motor connection VS 400-650 CG ACX36 EVO (EVO-WEB) SUP-EXH control gear

3x400V power supply, frequency converter with 1×230V or 3x400V supply



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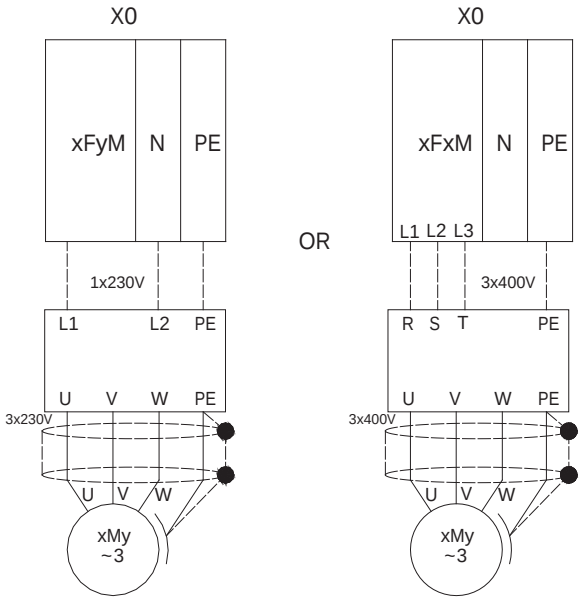
Appendix A Circuit diagram of motor connection depending on the type of the frequency converter

Frequency converters with 1×230V supply or with 3x400 supply



y = 1 or 2; 1 - for supply, 2 – for exhaust (according to the table D)

x = 1…4 - the next noumber of motor in AHU(according to the table D)

TABLE D

	1F1M	2F1M	1F2M	2F2M	1F3M	2F3M	1F4M	2F4M
VS 21-150 CG ACX-2 SUP	1M1							
VS 21-150 CG ACX-2 SUP-EXH	1M1	2M1						
VS 21-150 CG ACX-2 SUP-EXH (sup for VS 180-300)	1M1	1M2						
VS 180-300 CG ACX-2 SUP-EXH	1M1	2M1	1M2	2M2				
VS 180-300 CG ACX-2 SUP-EXH (sup for VS 400-650)	1M1	1M3	1M2	1M4				
VS 400-650 CG ACX-2 SUP-EXH	1M1	2M1	1M2	2M2	1M3	2M3	1M4	2M4

Appendix 15 The application control schemes

The control schemes for separate application are on the CD plate delivered with AHUs. In order to print the proper application scheme as the first one should find the application code on the AHU's technical data, next select „Control Aplication" from menu „AUTOMATICS" of CD plate and next choose suitable code and leading sensor.

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Appendix 16 INTEGRATION OVER MODBUS TCP/IP

MODBUS TCP/IP SERVER	
Interface type	10/100 MBit (IEEE 802.3U)
Protocol	Modbus TCP/IP
Device type	Server
Port	502
Limitations	max. 3 Client devices at one time
Supported functionalities	Read one input register (16-bit) Read one single state register (1-bit) Read/write one holding register (16-bit) Read/write one single coil register (1-bit)
Error messages	0x4001 – error code 1 – unsupported Modbus function 0x4002 – error code 2 – incorrect start address 0x4003 – error code 3 – data overflow 0x4004 – error code 4 – data unavailable

ONE SINGLE COIL REGISTER (R/W)

Scope object reference	Link to object member	Reg. addr.	Description	
0x2302 0x031D98DA	0x0100	1	alarm acknowledge flag	0-passive / 1-active
0x2204 ,Unit1\EmergencyStop’	0x3043	2	emergency stop flag (functional OR with physical input, the input must be enabled first in I/O configuration)	0-passive / 1-emerg.stop
0x2204 ,Unit1\ExtCtrl1’	0x3043	3	external control flag 1 (functional OR with physical input, the input must be enabled first in I/O configuration)	0-false / 1-true
0x2204 ,Unit1\ExtCtrl2’	0x3043	4	external control flag 2 (functional OR with physical input, the input must be enabled first in I/O configuration)	0-false / 1-true
0x2204 ,Unit1\SuWiSelBMS’	0x3043	5	summer/winter flag (functional OR with other selectors: HMI Advanced and optional digital input)	0-Winter / 1-Summer
0x2204 ,Unit1\FireAlm’	0x3043	6	fire alarm flag (functional OR with physical input)	0-passive / 1-fire alarm

ONE SINGLE STATE REGISTER (R)

Scope object reference	Link to object member	Reg. addr.	Description	
0x230B ,Unit1\AlmCl0’	0x0100	1	present value - top priority „0” alarm active	0-OK, 1-in alarm
0x230B ,Unit1\AlmCl1’	0x0100	2	present value - priority „1” alarm active	0-OK, 1-in alarm
0x230B ,Unit1\AlmCl2’	0x0100	3	present value - priority „1” alarm active	0-OK, 1-in alarm
0x230B ,Unit1\AlmCl3’	0x0100	4	present value - priority „1” alarm active	0-OK, 1-in alarm
0x2201 ,Unit1\ManualMode’	0x0100	5	manual mode activated	0-passive, 1-active
0x2204 ,Unit1\EmergencyStop’	0x0100	6	emergency stop input	0-passive, 1-active
0x2204 ,Unit1\ExtCtrl1’	0x0100	7	external control input 1	0-passive, 1-active
0x2204 ,Unit1\ExtCtrl2’	0x0100	8	external control input 2	0-passive, 1-active
0x2204 ,Unit1\SuWiSwitch’	0x0100	9	summer/winter switch input	0-passive, 1-active
0x2204 ,Unit1\FanAlm’	0x0103	10	fan alarm - no FC units	0-OK, 1-in alarm

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0x2204 ,Unit1\SplyFanAlm’	0x0103	11	fan alarm - FC units	0-OK, 1-in alarm
0x2204 ,Unit1\ExhFanAlm’	0x0103	12	fan alarm - FC units	0-OK, 1-in alarm
0x2204 ,Unit1\ClgAlm’	0x0103	13	DX unit alarm	0-OK, 1-in alarm
0x2204 ,Unit1\ClgPmpAlm’	0x0103	14	Chiller alarm	0-OK, 1-in alarm
0x2204 ,Unit1\HtgFrstDtctr’	0x0103	15	frost detector - air side	0-OK, 1-in alarm
0x2204 ,Unit1\HtgFrstDtctr2’	0x0103	16	frost detector - water side	0-OK, 1-in alarm
0x2204 ,Unit1\ElHtgAlm’	0x0103	17	electric heater alarm	0-OK, 1-in alarm
0x2204 ,Unit1\ExtraFrstDtctr’	0x0103	18	frost detector - air side - initial heater	0-OK, 1-in alarm
0x2204 ,Unit1\FilterAlm’	0x0103	19	filter alarm - common - no FC units	0-OK, 1-in alarm
0x2204 ,Unit1\SplyFilterAlm’	0x0103	20	supply filter alarm - FC units	0-OK, 1-in alarm
0x2204 ,Unit1\ExhFilterAlm’	0x0103	21	exhaust filter alarm - FC units	0-OK, 1-in alarm
0x2204 ,Unit1\FireAlm’	0x0103	22	fire alarm	0-OK, 1-in alarm
0x2201 ,Unit1\SplyTmpFireAlm’	0x0103	23	supply temperature fire alarm	0-OK, 1-in alarm
0x2201 ,Unit1\RtTmpFireAlm’	0x0103	24	exhaust temperature fire alarm	0-OK, 1-in alarm
0x2201 ,Unit1\ManualMode’	0x0103	25	manual mode activated	0-OK, 1-in alarm
0x2201 ,Unit1\MBCommAlm’	0x0103	26	Modbus internal error	0-OK, 1-in alarm
0x2203 ,Unit1\OutTmp’	0x0103	27	outside temperature	0-OK, 1-in alarm
0x2203 ,Unit1\SupplyTmp’	0x0103	28	supply temperature	0-OK, 1-in alarm
0x2203 ,Unit1\RoomTmp’	0x0103	29	room temperature	0-OK, 1-in alarm
0x2203 ,Unit1\ReturnAirTmp’	0x0103	30	exhaust temperature fire alarm	0-OK, 1-in alarm
0x2203 ,Unit1\ExhaustTmp’	0x0103	31	after recovery temperature	0-OK, 1-in alarm
0x2203 ,Unit1\HrecWtrTmp’	0x0103	32	after recovery temperature (glycol system)	0-OK, 1-in alarm
0x2203 ,Unit1\ExtSetpoint.Spv’	0x0103	33	external setpoint	0-OK, 1-in alarm
0x2204 ,Unit1\Hrec.RRG.Disp.Status’	0x0103	34	RRG drive status	0-OK, 1-in alarm
0x2204 ,Unit1\Hrec.RRG.Disp.Comm1’	0x0103	35	RRG communication status	0-OK, 1-in alarm
0x2204 ,Unit1\DispSup1.Status’	0x0103	36	FC supply 1 status	0-OK, 1-in alarm
0x2204 ,Unit1\DispSup1.Comm’	0x0103	37	FC supply 1 communication status	0-OK, 1-in alarm
0x2204 ,Unit1\DispSup2.Status’	0x0103	38	FC supply 2 status	0-OK, 1-in alarm
0x2204 ,Unit1\DispSup2.Comm’	0x0103	39	FC supply 2 communication status	0-OK, 1-in alarm
0x2204 ,Unit1\DispSup3.Status’	0x0103	40	FC supply 3 status	0-OK, 1-in alarm
0x2204 ,Unit1\DispSup3.Comm’	0x0103	41	FC supply 3 communication status	0-OK, 1-in alarm
0x2204 ,Unit1\DispSup4.Status’	0x0103	42	FC supply 4 status	0-OK, 1-in alarm
0x2204 ,Unit1\DispSup4.Comm’	0x0103	43	FC supply 4 communication status	0-OK, 1-in alarm
0x2204 ,Unit1\DispExh1.Status’	0x0103	44	FC exhaust 1 status	0-OK, 1-in alarm
0x2204 ,Unit1\DispExh1.Comm’	0x0103	45	FC exhaust 1 communication status	0-OK, 1-in alarm
0x2204 ,Unit1\DispExh2.Status’	0x0103	46	FC exhaust 2 status	0-OK, 1-in alarm
0x2204 ,Unit1\DispExh2.Comm’	0x0103	47	FC exhaust 2 communication status	0-OK, 1-in alarm
0x2204 ,Unit1\DispExh3.Status’	0x0103	48	FC exhaust 3 status	0-OK, 1-in alarm
0x2204 ,Unit1\DispExh3.Comm’	0x0103	49	FC exhaust 3 communication status	0-OK, 1-in alarm
0x2204 ,Unit1\DispExh4.Status’	0x0103	50	FC exhaust 4 status	0-OK, 1-in alarm
0x2204 ,Unit1\DispExh4.Comm’	0x0103	51	FC exhaust 4 communication status	0-OK, 1-in alarm

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ONE INPUT REGISTER (R)				
Scope object reference	Link to object member	Reg. addr.	Description	
0x230B ,Unit1\ActOpMode’	0x0100	1	actual operating mode	0-Off, 1-On/Comfort, 2-Economy, 3-not used, 4-not used, 5-Nightcooling, 6-Standby Htg/Clg, 7-Night Temp. Test, 8-not used, 9-Fire, 10-Stop (Alarm/Emerg. stop), 11-Fan overrun, 12-Startup, 13-Comfort+St1, 14-Comfort+St2, 15-Economy+St1, 16-Economy+St2
0x230B ,Unit1\ActFanStep’	0x0100	2	actual fan	step 0-Off, 1-Stage1, 2-Stage2
0x2302 ,Unit1\TimeSchedStTmp’	0x0100	3	actual calendar setting	0-Off, 1-EcoSt1, 2-ComfSt1, 3-EcoSt2, 4-ComfSt2
0x230B ,Unit1\ExtControl.ActMode’	0x0100	4	fan step from external controls	0-Off, 1-Stage1, 2-Stage2
0x2302 ,Unit1\OpModeAutoManStTmp. Swtch’	0x0100	5	operating mode from HMI	0-Auto, 1-OFF, 2-EcoSt1, 3-ComfSt1, 4-EcoSt2, 5-ComfSt2
0x2207 ,Unit1\Damper.Sply.OnOff’	0x0100	6	actual damper state	0-closed, 1-opened
0x2208 ,Unit1\SplyFan.Cmd.St’	0x0100	7	actual supply fan step (FC)	1-Off, 2-Stage1, 3-Stage2
0x2206 ,Unit1\SplyFan.Var.Pos’	0x0100	8	actual supply fan setpoint	0..100%
0x2208 ,Unit1\ExhFan.Cmd.St’	0x0100	9	actual exhaust fan step (FC)	1-Off, 2-Stage1, 3-Stage2
0x2206 ,Unit1\ExhFan.Var.Pos’	0x0100	10	actual exhaust fan setpoint	0..100%
0x2206 ,Unit1\Cooling.Pos’	0x0100	11	actual cooling valve command	0..100%
0x2207 ,Unit1\Cooling.Pmp.Cmd.OnOff’	0x0100	12	actual chiller command	0-Off, 1-On
0x2208 ,Unit1\Cooling.CmdDx.St’	0x0100	13	actual DX unit command	1-Off, 2-Stage1, 3-Stage2
0x2206 ,Unit1\Hrec.Pos’	0x0100	14	actual heat recovery command	0..100%
0x2207 ,Unit1\Hrec.Pmp.Cmd.OnOff’	0x0100	15	actual recovery pump command	0-Off, 1-On
0x2206 ,Unit1\HrecDamp.Pos’	0x0100	16	actual heat recovery damper command	0..100%
0x230A ,Unit1\HrecDamp.Rec’	0x0100	17	actual heat recovery damper command	0..100%
0x2206 ,Unit1\Heating.Pos’	0x0100	18	actual heating valve command	0..100%
0x2207 ,Unit1\Heating.Pmp.Cmd.OnOff’	0x0100	19	actual heating pump command	0..100%
0x2206 ,Unit1\ElectricalHtg.Pos’	0x0100	20	actual command for electric heater	0..100%

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0x2206 ,Unit1\ExtraHtg.Pos'	0x0100	21	actual heating valve command - INITIAL HEATER	0..100%
0x2207 ,Unit1\ExtraHtg.Pmp.Cmd. OnOff'	0x0100	22	actual heating pump commadn - INITIAL HEATER	0-Off, 1-On
0x2207 ,Unit1\AlmOutHigh'	0x0100	23	actual state of alarm relay Q5	0-Off, 1-On (In alarm)
0x2203 ,Unit1\OutTmp'	0x0100	24	outside temperature	(x0.1)
0x2203 ,Unit1\SupplyTmp'	0x0100	25	supply temperature	(x0.1)
0x230A ,Unit1\ValidRoomTmp'	0x0100	26	actual room temperature	(x0.1)
0x2203 ,Unit1\ReturnAirTmp'	0x0100	27	exhaust temperature	(x0.1)
0x2203 ,Unit1\ExhaustTmp'	0x0100	28	after recovery temperature	(x0.1)
0x2203 ,Unit1\HrecWtrTmp'	0x0100	29	after recovery temperature - glycol system	(x0.1)
0x2203 ,Unit1\ExtraSupplyTmp'	0x0100	30	initial heater temperature	(x0.1)
0x2203 ,Unit1\ExtSetpoint.Spv'	0x0100	31	external setpoint	(x0.1)
0x230A ,Unit1\ActMainSpvHtg'	0x0100	32	actual main setpoint for heating	(x0.1)
0x230A ,Unit1\ActMainSpvClg'	0x0100	33	actual main setpoint for cooling	(x0.1)
0x230A ,Unit1\ActCascSpvHtg'	0x0100	34	actual cascade setpoint for heating	(x0.1)
0x230A ,Unit1\ActCascSpvClg'	0x0100	35	actual cascade setpoint for cooling	(x0.1)
0x230A ,Unit1\Hrec.RRG.Disp.Freq'	0x0100	36	actual FC RRG frequency	
0x230A ,Unit1\Hrec.RRG.Disp.RPM'	0x0100	37	actual FC RRG rpm	
0x230A ,Unit1\Hrec.RRG.Disp.Curr'	0x0100	38	actual FC RRG current	
0x230A ,Unit1\DispSup1.Freq'	0x0100	39	actual FC supply 1 frequency	
0x230A ,Unit1\DispSup1.RPM'	0x0100	40	actual FC supply 1 rpm	
0x230A ,Unit1\DispSup1.Curr'	0x0100	41	actual FC supply 1 current	
0x230A ,Unit1\DispSup2.Curr'	0x0100	42	actual FC supply 2 current	
0x230A ,Unit1\DispSup3.Curr'	0x0100	43	actual FC supply 3 current	
0x230A ,Unit1\DispSup4.Curr'	0x0100	44	actual FC supply 4 current	
0x230A ,Unit1\DispExh1.Freq'	0x0100	45	actual FC exhaust 1 frequency	
0x230A ,Unit1\DispExh1.RPM'	0x0100	46	actual FC exhaust 1 rpm	
0x230A ,Unit1\DispExh1.Curr'	0x0100	47	actual FC exhaust 1 current	
0x230A ,Unit1\DispExh2.Curr'	0x0100	48	actual FC exhaust 2 current	
0x230A ,Unit1\DispExh3.Curr'	0x0100	49	actual FC exhaust 3 current	
0x230A ,Unit1\DispExh4.Curr'	0x0100	50	actual FC exhaust 4 current	
0x2302 0x00006994	0x0100	51	selected main temperature sensor	0-supply 1-room 2-exhaust
0x2302 0x0000480E	0x0100	52	selected control gear type	0- VS10-15, 1- VS10-15 with FC, 2- VS21-650 with FC
0x2302 0x00009E7B	0x0100	53	selected application code letter	0-AD, 1-AG, 2-AP, 3-AR, 4-AS
0x2303 0x000020F4	0x0100	54	selected application code number	0..936
0x2302 0x0000BEDF	0x0100	55	actual state of the program	0-Config, 1-Running

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ONE HOLDING REGISTER (R/W)				
Scope object reference	Link to object member	Reg. addr.	Description	
0x2302 ,Unit1\OpModeBmsTimeStTmp. Swtch'	0x0100	1	operating mode from BMS	0-Auto, 1-Off, 2-EcoSt1, 3-ComfSt1, 4-EcoSt2, 5-ComfSt2
0x2300 ,Unit1\TmpSpv.CoSpv'	0x0100	2	temperature setpoint for comfort	(x0.1)
0x2300 ,Unit1\TmpSpv.CoDz'	0x0100	3	temperature deadzone for comfort	(x0.1)
0x2300 ,Unit1\TmpSpv.EcSpv'	0x0100	4	temperature setpoint for economy	(x0.1)
0x2300 ,Unit1\TmpSpv.EcDz'	0x0100	5	temperature deadzone for economy	(x0.1)
0x2300 ,Unit1\ExtraSpv'	0x0100	6	temperature setpoint for initial heater	(x0.1)
0x230F ,Unit1\TmpCascCtlr'	0x000E	7	min supply temperature	(x0.1)
0x230F ,Unit1\TmpCascCtlr'	0x000D	8	max supply temperature	(x0.1)
0x2301 ,Unit1\SplyFanSpv.St1Spv'	0x0100	9	supply FC frequency setpoint for Stage1	(0..100%)
0x2301 ,Unit1\SplyFanSpv.St2Spv'	0x0100	10	supply FC frequency setpoint for Stage2	(0..100%)
0x2301 ,Unit1\ExhFanSpv.St1Spv'	0x0100	11	exhaust FC frequency setpoint for Stage1	(0..100%)
0x2301 ,Unit1\ExhFanSpv.St2Spv'	0x0100	12	exhaust FC frequency setpoint for Stage2	(0..100%)
0x2300 ,Unit1\NightCool.MinOutTmp'	0x0100	13	min outside temperature for Night Cooling	(x0.1)
0x2300 ,Unit1\NightCool.OnDiff'	0x0100	14	on difference for Night Cooling	(x0.1)
0x2300 ,Unit1\NightCool.RmHys'	0x0100	15	hysteresis for Night Cooling	(x0.1)
0x2300 ,Unit1\TmpStart.HtgStrt'	0x0100	16	standby start temperature for heating	(x0.1)
0x2300 ,Unit1\TmpStart.HtgSpv'	0x0100	17	standby heating setpoint	(x0.1)
0x2300 ,Unit1\TmpStart.ClgStrt'	0x0100	18	standby start temperature for cooling	(x0.1)
0x2300 ,Unit1\TmpStart.ClgSpv'	0x0100	19	standby cooling setpoint	(x0.1)
0x2300 ,Unit1\Cooling.OffTmp'	0x0100	20	outside temperature limit for cooling	(x0.1)
0x2300 ,Unit1\HrecDamp.minFrshAir'	0x0100	21	min fresh air rate for heat recovery damper	(0..100%)
0x2305 ,Unit1\Cooling.Ctlr'	0x0009	22	Kp - cooling regulator	(x0.01)
0x2305 ,Unit1\Cooling.Ctlr'	0x000A	23	Ti - cooling regulator	
0x2305 ,Unit1\Cooling.Ctlr'	0x000B	24	Td - cooling regulator	
0x2305 ,Unit1\Hrec.Ctlr'	0x0009	25	Kp - heat recovery regulator	(x0.01)
0x2305 ,Unit1\Hrec.Ctlr'	0x000A	26	Ti - heat recovery regulator	
0x2305 ,Unit1\Hrec.Ctlr'	0x000B	27	Td - heat recovery regulator	
0x2305 ,Unit1\Hrec.Frst.Ctlr'	0x0009	28	Kp - heat recovery frost protection regulator	(x0.01)
0x2305 ,Unit1\Hrec.Frst.Ctlr'	0x000A	29	Ti - heat recovery frost protection regulator	
0x2305 ,Unit1\Hrec.Frst.Ctlr'	0x000B	30	Td - heat recovery frost protection regulator	
0x2305 ,Unit1\HrecDamp.Ctlr'	0x0009	31	Kp - heat recovery damper regulator	(x0.01)
0x2305 ,Unit1\HrecDamp.Ctlr'	0x000A	32	Ti - heat recovery damper regulator	
0x2305 ,Unit1\HrecDamp.Ctlr'	0x000B	33	Td - heat recovery damper regulator	
0x2305 ,Unit1\Heating.Ctlr'	0x0009	34	Kp - heating regulator	(x0.01)
0x2305 ,Unit1\Heating.Ctlr'	0x000A	35	Ti - heating regulator	
0x2305 ,Unit1\Heating.Ctlr'	0x000B	36	Td - heating regulator	
0x2305 ,Unit1\ElectricalHtg.Ctlr'	0x0009	37	Kp - electric heating regulator	(x0.01)
0x2305 ,Unit1\ElectricalHtg.Ctlr'	0x000A	38	Ti - electric heating regulator	

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0x2305 ,Unit1\ElectricalHtg.Ctlr’	0x000B	39	Td - electric heating regulator	
0x2305 ,Unit1\ExtraHtg.Ctlr’	0x0009	40	Kp - initial heating regulator	(x0.01)
0x2305 ,Unit1\ExtraHtg.Ctlr’	0x000A	41	Ti - initial heating regulator	
0x2305 ,Unit1\ExtraHtg.Ctlr’	0x000B	42	Td - initial heating regulator	
0x230F ,Unit1\TmpCascCtlr’	0x000A	43	Kp - cascade temperature regulator	(x0.1)
0x230F ,Unit1\TmpCascCtlr’	0x000B	44	Ti - cascade temperature regulator	
0x2301 ,Unit1\SplyFanSpv.RampUp’	0x0100	45	supply fan FC ramp up	
0x2301 ,Unit1\SplyFanSpv.RampDn’	0x0100	46	supply fan FC ramp down	
0x2301 ,Unit1\ExhFanSpv.RampUp’	0x0100	47	exhaust fan FC ramp up	
0x2301 ,Unit1\ExhFanSpv.RampDn’	0x0100	48	exhaust fan FC ramp down	
0x0010 0x00000001	0x0001	49	RTC hour	
0x0010 0x00000001	0x0002	50	RTC minutes	
0x0010 0x00000001	0x0003	51	RTC seconds	
0x0010 0x00000001	0x0004	52	RTC year	(YYYY)
0x0010 0x00000001	0x0005	53	RTC month	(MM)
0x0010 0x00000001	0x0006	54	RTC day	(DD)
0x220D ,Unit1\02:Monday’	0x0202	55	time setting for zone 1 Note! Mind the swapped bytes and dec / hex conversion. Example: 15:32 1. swap and convert to 16# 32 = 16#0020 15 = 16#000F 2. shift the minutes to the left by 2 digits 16#2000 3. minutes OR hours 16#200F 4. convert to decimal and send 16#200F = 8207 dec	
0x220D ,Unit1\02:Monday’	0x0203	56	time setting for zone 2	
0x220D ,Unit1\02:Monday’	0x0204	57	time setting for zone 3	
0x220D ,Unit1\02:Monday’	0x0205	58	time setting for zone 4	
0x220D ,Unit1\02:Monday’	0x0206	59	time setting for zone 5	
0x220D ,Unit1\02:Monday’	0x0208	60	set mode for zone 1	0-Off, 1-Eco 1stage, 2-Comf 1stage, 3-Eco 2stage, 4-Komf 2stage
0x220D ,Unit1\02:Monday’	0x0209	61	set mode for zone 2	
0x220D ,Unit1\02:Monday’	0x020A	62	set mode for zone 3	
0x220D ,Unit1\02:Monday’	0x020B	63	set mode for zone 4	
0x220D ,Unit1\02:Monday’	0x020C	64	set mode for zone 5	
0x220D ,Unit1\02:Tuesday’	0x0202	65	time setting for zone 1	
0x220D ,Unit1\02:Tuesday’	0x0203	66	time setting for zone 2	
0x220D ,Unit1\02:Tuesday’	0x0204	67	time setting for zone 3	
0x220D ,Unit1\02:Tuesday’	0x0205	68	time setting for zone 4	
0x220D ,Unit1\02:Tuesday’	0x0206	69	time setting for zone 5	
0x220D ,Unit1\02:Tuesday’	0x0208	70	set mode for zone 1	
0x220D ,Unit1\02:Tuesday’	0x0209	71	set mode for zone 2	
0x220D ,Unit1\02:Tuesday’	0x020A	72	set mode for zone 3	
0x220D ,Unit1\02:Tuesday’	0x020B	73	set mode for zone 4	
0x220D ,Unit1\02:Tuesday’	0x020C	74	set mode for zone 5	
0x220D ,Unit1\02:Wednesday’	0x0202	75	time setting for zone 1	
0x220D ,Unit1\02:Wednesday’	0x0203	76	time setting for zone 2	

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0x220D ,Unit1\02:Wednesday’	0x0204	77	time setting for zone 3	
0x220D ,Unit1\02:Wednesday’	0x0205	78	time setting for zone 4	
0x220D ,Unit1\02:Wednesday’	0x0206	79	time setting for zone 5	
0x220D ,Unit1\02:Wednesday’	0x0208	80	set mode for zone 1	
0x220D ,Unit1\02:Wednesday’	0x0209	81	set mode for zone 2	
0x220D ,Unit1\02:Wednesday’	0x020A	82	set mode for zone 3	
0x220D ,Unit1\02:Wednesday’	0x020B	83	set mode for zone 4	
0x220D ,Unit1\02:Wednesday’	0x020C	84	set mode for zone 5	
0x220D ,Unit1\02:Thursday’	0x0202	85	time setting for zone 1	
0x220D ,Unit1\02:Thursday’	0x0203	86	time setting for zone 2	
0x220D ,Unit1\02:Thursday’	0x0204	87	time setting for zone 3	
0x220D ,Unit1\02:Thursday’	0x0205	88	time setting for zone 4	
0x220D ,Unit1\02:Thursday’	0x0206	89	time setting for zone 5	
0x220D ,Unit1\02:Thursday’	0x0208	90	set mode for zone 1	
0x220D ,Unit1\02:Thursday’	0x0209	91	set mode for zone 2	
0x220D ,Unit1\02:Thursday’	0x020A	92	set mode for zone 3	
0x220D ,Unit1\02:Thursday’	0x020B	93	set mode for zone 4	
0x220D ,Unit1\02:Thursday’	0x020C	94	set mode for zone 5	
0x220D ,Unit1\02:Friday’	0x0202	95	time setting for zone 1	
0x220D ,Unit1\02:Friday’	0x0203	96	time setting for zone 2	
0x220D ,Unit1\02:Friday’	0x0204	97	time setting for zone 3	
0x220D ,Unit1\02:Friday’	0x0205	98	time setting for zone 4	
0x220D ,Unit1\02:Friday’	0x0206	99	time setting for zone 5	
0x220D ,Unit1\02:Friday’	0x0208	100	set mode for zone 1	
0x220D ,Unit1\02:Friday’	0x0209	101	set mode for zone 2	
0x220D ,Unit1\02:Friday’	0x020A	102	set mode for zone 3	
0x220D ,Unit1\02:Friday’	0x020B	103	set mode for zone 4	
0x220D ,Unit1\02:Friday’	0x020C	104	set mode for zone 5	
0x220D ,Unit1\02:Saturday’	0x0202	105	time setting for zone 1	
0x220D ,Unit1\02:Saturday’	0x0203	106	time setting for zone 2	
0x220D ,Unit1\02:Saturday’	0x0204	107	time setting for zone 3	
0x220D ,Unit1\02:Saturday’	0x0205	108	time setting for zone 4	
0x220D ,Unit1\02:Saturday’	0x0206	109	time setting for zone 5	
0x220D ,Unit1\02:Saturday’	0x0208	110	set mode for zone 1	
0x220D ,Unit1\02:Saturday’	0x0209	111	set mode for zone 2	
0x220D ,Unit1\02:Saturday’	0x020A	112	set mode for zone 3	
0x220D ,Unit1\02:Saturday’	0x020B	113	set mode for zone 4	
0x220D ,Unit1\02:Saturday’	0x020C	114	set mode for zone 5	
0x220D ,Unit1\02:Sunday’	0x0202	115	time setting for zone 1	
0x220D ,Unit1\02:Sunday’	0x0203	116	time setting for zone 2	
0x220D ,Unit1\02:Sunday’	0x0204	117	time setting for zone 3	
0x220D ,Unit1\02:Sunday’	0x0205	118	time setting for zone 4	
0x220D ,Unit1\02:Sunday’	0x0206	119	time setting for zone 5	
0x220D ,Unit1\02:Sunday’	0x0208	120	set mode for zone 1	
0x220D ,Unit1\02:Sunday’	0x0209	121	set mode for zone 2	
0x220D ,Unit1\02:Sunday’	0x020A	122	set mode for zone 3	
0x220D ,Unit1\02:Sunday’	0x020B	123	set mode for zone 4	
0x220D ,Unit1\02:Sunday’	0x020C	124	set mode for zone 5	

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